DOCUMENT RESUME

ED 146 011	SE 022 847

TITLE	Mathematics Modified General Program, Grades Seven, Eight, Nine. Curriculum Bulletin Number 113.
INSTITUTION	Cincinnati Public Schools, Ohio.
PUB DATE	62
NOTE	211p.; Not available in hard copy due to copyright restrictions; Contains occasional light and broken type
AVAILABLE FROM	Clerk Treasurer, Cincinnati Public Schools, 230 East 9th St., Cincinnati, Ohio 45202 ($4.50)
EDRS PRICE	MF-$0.83 Plus Postage. HC Not Available from EDRS.
DESCRIPTORS	Basic Skills; *Curriculum Guides; *Instructional Materials; Junior High Schools; Learning Disabilities; Low Achievers; Mathematics Education; Secondary Education; *Secondary School Mathematics; *Study Guides; *Worksheets

ABSTRACT

This curriculum bulletin contains materials for students in grades 7, 8, and 9 who have learning difficulties. The first chapter discusses characteristics and needs of these students. Teaching procedures are briefly discussed in the second chapter. A suggested outline of content is followed by worksheets or study guides for approximately 35 topics at each grade level. These are designed to be used at the end of the instructional period to determine whether a concept has been taught successfully. Several resource units and games are also included. (MS)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

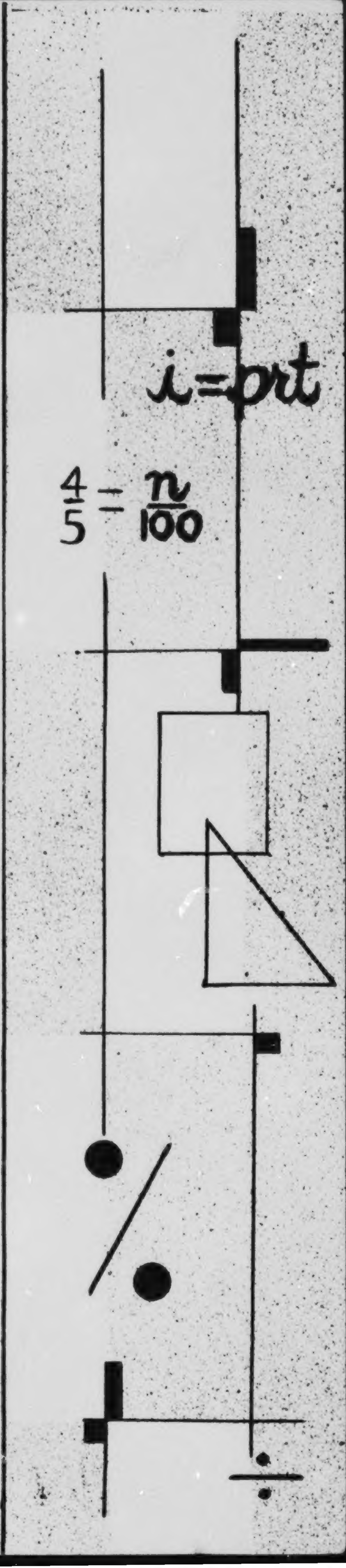
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

MATHEMATICS

ED146011

"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY
Roy Mathews

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."



MODIFIED GENERAL PROGRAM

Grades 7-8-9

CURRICULUM BULLETIN 113

Cincinnati Public Schools

1962

SE 022 847

FOREWORD

The approach to learning is not the same for all boys and girls, and the needs of some pupils are met more successfully by a modified program than by one which makes demands that pupils cannot meet. A committee of teachers worked for several years to outline an appropriately modified program in mathematics. Since suitable materials were almost non-existent, the teachers prepared sets of sample study guide sheets. These lesson sheets are of various types and include developmental, review, and skill maintenance lessons. They are designed to serve as an effective guide as teachers of modified general classes prepare their own materials for classroom use.

Curriculum Bulletins 1 and 2 are the official guides for general mathematics, grades 7, 8, and 9 and should be used whenever more comprehensive procedures are indicated. These bulletins describe a wide variety of activities which the teacher may adapt for modified general classes. Wise selection of material, activities, and presentation techniques, as well as a sympathetic understanding of the pupils' abilities and interests, encourage teaching that will enable pupils to reach their full potential in meeting the responsibilities of citizenship.

All of the teachers in the Modified General Program have helped to develop this curriculum bulletin but those listed below were chiefly responsible for the final form of the bulletin.

Mary Baughman	Cutter Junior High School
Marlene Beigel	Western Hills High School
Dale Birdsall	Eastern Hills Junior High School
Ruth Blum	Oyler Junior High School
Norman Bolds	Ach Junior High School

Frank Braun	Cutter Junior High School
Norma Burney	Cutter Junior High School
Gary Cobb	Cutter Junior High School
Dorothy Coleman	Bloom Junior High School
Nola Conboy	Cutter Junior High School
Roger Corbly	Eastern Hills Junior High School
Albert Dixon	Ach Junior High School
William Etzel	Hughes High School
Cecilia Falk	Schwab Junior High School
Don Hanon	Hughes High School
Chloe Harnish	Cutter Junior High School
George Hull	Porter Junior High School
Fintan Langenderfer	Schwab Junior High School
William Lippert	Woodward High School
Charleen Matsudo	Heinold Junior High School
Ernest Mills	Ach Junior High School
Ralph Sleight	Withrow High School
Cleopatra Watson	Ach Junior High School
Harry Whitehill	Bloom Junior High School

Sarah Greenholz and Mildred Keiffer, Supervisors of Mathematics, and Roy Matthews, Associate Supervisor, served as advisors under the general direction of Ralph E. Shauck, Director of Secondary Education.

Robert P. Curry
Associate Superintendent

Approved:

Wendell H. Pierce
Superintendent of Schools
September, 1962

TABLE OF CONTENTS

PAGE

Foreword. iii

Introduction - Part I
Understanding the Modified General Pupil 1

Introduction - Part II
Teaching Mathematics to the Modified General Pupil 13

Selected Teacher Reference Books. 21

Outline of Content for the Modified General Program 25

Study Guides

Index. 52
Seventh Grade. 59
Eighth Grade 105
Ninth Grade. 151

Resource Units

Seventh Grade. 200
Eighth Grade 204
Ninth Grade. 206

Games for Developing Skills 215

Materials Useful in the Modified General Program. 219

INTRODUCTION

Part I

UNDERSTANDING THE MODIFIED GENERAL PUPIL

Successful instruction for pupils in the Modified General Program of Instruction needs to be realistically child-centered rather than predominantly subject-centered. It is necessary to approach the total curriculum for these boys and girls with an awareness of certain definite factors.

> These boys and girls can and do learn. They move in social groups as normal members of society who in a great many situations are not conspicuous for their lack of ability. In general, what is expected of all citizens is expected of them.
>
> The pupils need contact with normal situations. The teacher guards against the pupils' knowing or feeling that they are different; and helps them to understand and accept the fact that what individuals can do varies and that their responsibilities, needs, and contributions vary as well.
>
> Maladjustments may be only temporary. Sometimes changes in environment and circumstances bring amazing changes in people. The teacher finds that continuous reappraisal is necessary so that at any time pupils who are capable may be transferred to regular groups.
>
> In order to encourage the development of the desired level of maturity, a balance needs to be established between permissiveness and maintenance of the usual restrictions that surround everyone.
>
> Methods of teaching, the selection of materials, the selection of the teacher, and expectations of pupil response must be considered in terms of the mental age rather than the chronological age of the pupils.

General Teaching Objectives

These general objectives listed below are considered important for the total Modified General Program of Instruction. They indicate that teachers must place emphasis on individual achievement as much as possible.

To define the curriculum as all experiences under school guidance

To help pupils understand and accept themselves and others

To help pupils see the importance of gaining new understandings, attitudes, skills, habits, and patterns of thought

To help pupils grow in reading skills in all areas of learning

To develop an awareness of the relation between the opportunities for employment which are open to job-seekers and the number of years they complete in high school

To alleviate fear and hostility

To develop self-confidence

To prevent apathy and resignation

To improve health by referring pupils to proper authorities for the correction of defects, and by helping them establish good health habits

The Pupils in the Modified General Program of Instruction

Pupils within the Modified General classification often show many of the following characteristics:

Eye and ear defects
Poor general health
Some difficulty in coordination of eye-hand skills
Some difficulty in motor ability
Some speech defects
Irregular attendance
Lack of perception
Short memory
Lack of ability to evaluate actions
Tendency toward inarticulateness
Lack of ability to concentrate
Retardation in language expression
Lack of creative imagination
Inadequate powers of generalization, abstraction, and comparison
Inadequate rote learning skills
Reading retardation
General range of intelligence, 85 I. Q. and below with scholastic retardation of approximately two years
High mobility of residence
Low interest in group work, clubs, and group play
Withdrawal
Shyness or a desire to be noticed
Lethargy
Inattentiveness
Restlessness
Lack of self-esteem
Dislike for authority
Dislike for school
Lack of confidence

Cumulative behavior defects
Lack of initiative
Tendency to act to satisfy needs with little foresight as to consequences
Poor management of material, clothing, money, time
Slowness in acquiring social skills
Short span of attention
Lack of appreciation of aesthetic values.

Only when the teacher understands pupils as individuals can there be a classroom atmosphere that permits successful instruction. All subject areas may contribute tools useful in gaining insight into the problems of these boys and girls; ways to gain their confidence and trust must, however, be planned carefully and pursued with consistent effort. Only occasionally will the door to understanding open through incidental or chance questioning. Ambitions and anxieties are not revealed when only facts and subject matter are emphasized in a lesson. The teacher should use pupil feelings and reactions to motivate mastery of subject matter for individual improvement.

By having some detailed knowledge of each pupil's school and social adjustment, ethical attitudes, personal philosophies, and belief in himself and others, the teacher is able to plan more effectively for instructional activity. An effective way for the teacher to learn to know the attitudes that influence young people lies in creative writing where the teaching of language skills may serve a double purpose. Personal writing yields many concrete examples of how boys and girls reveal themselves to such an extent that the resulting awareness enables the teacher to help pupils significantly with many kinds of problems. Activities promoted to get this insight and knowledge should be considered part of the curriculum.

Another way to know and understand these boys and girls is through the relationship a teacher builds by showing at all times a sincere, warm, and friendly interest during the face-to-face contacts in and out of the classroom. With self-esteem rebuilt, good feelings toward others developed, and desires to improve encouraged, pupils find the way to learning.

The teacher should avoid quick, thoughtless comments that hurt or belittle pupils and should guard against the pressures of routine, against personal likes and dislikes, and against a thousand stimuli that tend to make a teacher irritable, impatient, and weary. He should try always to show interest in pupils and to follow through on all available bits of pertinent information to the end that pupils may profit. Only in such an atmosphere of friendly cooperation and patient consideration does this type of child adjust and develop. The teacher must learn that one sharp rebuke, one inconsiderate action on his part can ruin weeks of slow progress in improving pupil attitude. The teacher must remember that establishing the rapport necessary for a favorable adjustment to learning takes time, but that the time is well spent. Successful teachers in this program use a firm, fair, and flexible policy which generates an atmosphere of confidence conducive to learning.

Teaching in the Modified General Program

Knowing that the school may be the only place where pupils can get any kind of planned emotional training or education, the teacher should try to develop in them self-esteem, feelings of worth, and a willingness to try to achieve, join in, and belong; to break the pattern of past failures and inabilities; to help them feel good about the world; and to relieve tensions and apprehensions. The teacher should surround the boys and girls with a climate of respect, liking, and support; give them attention; help them face facts; aid them in solving problems; and offer patience and warmth in all relationships. The school should encourage them to participate and work with others, keeping the children as free as possible from compulsion of time or unrealistic standards of achievement.

Knowing that these pupils need training in human relations for their own good and that of society, teachers should be alert to every topic in all subject matter areas which lends itself to the development of good human relations. Mutual respect between teacher and pupils, among pupils themselves, and between pupils and society needs to be given consistent emphasis. Language arts, social studies, science, and mathematics offer many opportunities to develop and practice such respect. Lesson planning should be geared to this objective. Development of skills in communication and computation; knowledge of peoples, places, and times; and an understanding of the interrelationships in their physical environment can come if the content of these areas is used in such a way as to show its relation to the lives and experiences of the pupils.

So that these pupils may live in normal social groups where they perform the usual tasks of citizens and human beings, the teacher must help them acquire some knowledge of the physical world and its relationships without attempting to transmit a large body of isolated scientific facts. Instruction should deal with modes of thinking, with ways of interpreting, with attitudes, and with appreciations. It must be remembered, though, that competence in dealing with quantity is expected. In economic community life each citizen is responsible for conducting his own financial affairs and to this end must master fundamental computation. Experimentation and discovery of quantitative relationships, based on the pupil's personal experience, lead to understanding without which drill is fruitless and retention is unreliable. Pupils in the Modified General Program of Instruction can acquire elementary skills in observing, making deductions, and relating ideas as well as attain freedom from fears, false conceptions, and superstitions. It should be remembered that for them there is special value in listening skills.

If it is true that many forces in modern society tend to depersonalize our daily lives, the school should provide opportunities to encourage self-expression. Consultation with teachers in other departments who see the pupils concerned may lead to effective correlation through the careful use of the arts, crafts, music, creative writing, speaking, and project activities which are within appropriate limits and can give outlet to emotional drives and reduce maladjustments. Non-verbal expression may induce better attitudes, offer a release from inner strife, and free the use of imagination. The urge of self-expression lives within all individuals. Good results usually become evident when the teacher patiently clears the way to active participation.

Selection of Content

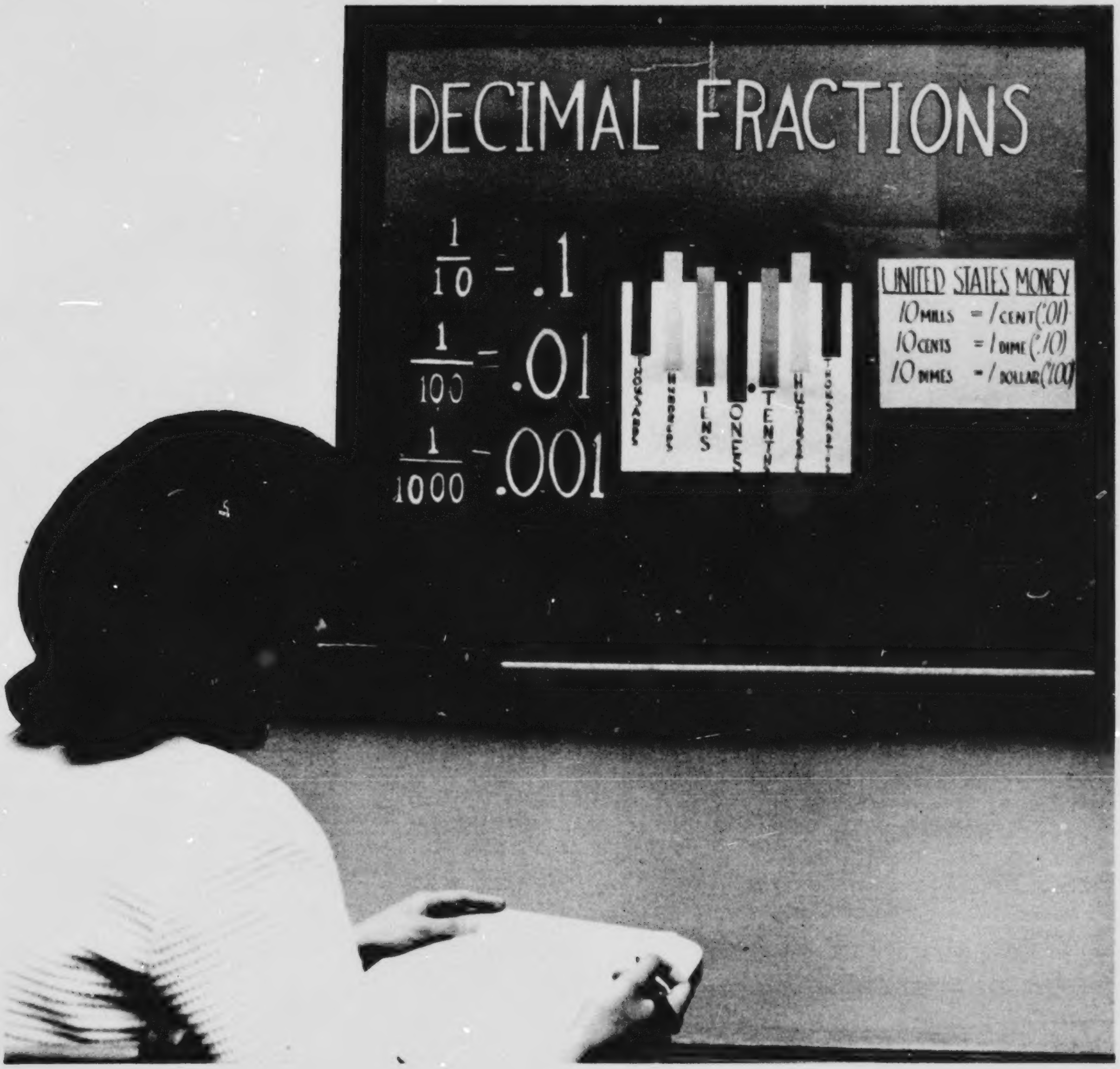
Pupils in the Modified General Program of Instruction, as this introduction has indicated, should not be expected to build up a large fund of facts. Success in teaching these pupils cannot be measured solely by their scores on an examination that asks for extensive factual information. Society, however, finds knowledge an asset. The school should try to impart as much useful information as the pupils can assimilate. An individual's life is enhanced by his mental recognition of things. It has already been pointed out that the teacher of less able pupils may well concentrate for a considerable period of time on helping them become favorably disposed and conditioned to learning and to school.

Characteristics of pupils in the Modified General Program of Instruction make their learning a different process from that of average boys and girls. Certain conditions must be taken into account when subject matter is selected, teaching procedures are planned, and over-all evaluations are made.

Facts are learned slowly by these pupils.

A carry-over of skills and facts from one situation to another is always difficult to achieve and often altogether absent.

Lessons must be simple. The body of content must be presented in small bits that are uncomplicated by frequent demands for reasoning, skill in memory, deduction, or recognition of relationships.


DECIMAL FRACTIONS
1/10 = .1
1/100 = .01
1/1000 = .001
THOUSANDS
HUNDREDS
TENS
ONES
TENTHS
HUNDREDTHS
THOUSANDTHS
UNITED STATES MONEY
10 MILLS = 1 CENT (.01)
10 CENTS = 1 DIME (.10)
10 DIMES = 1 DOLLAR (1.00)

EACH TOPIC MUST BE DEVELOPED IN SMALL STEPS

Much of the teaching must be through oral and visual means: demonstrations, objects, samples, and pictures.

The teacher cannot rely on individual responsibility for seeking information and bringing material to class, but must supply much of what is needed.

Content of learning must be closely allied to the every-day experiences of the learners.

Current events may be used advantageously to stimulate interest in many teaching procedures.

Materials to be read for the sake of informational content or entertainment should be within the pupil's reading skill, and it is important that they have an interest level appropriate to his age and interests.

Skills

The more skills pupils have, the more effectively they can help themselves to live well. Some forces in our society make certain skills necessary for self-protection. The greater the ability to speak, to write, to read, and to compute, the less vulnerable individuals are to abuse and to misuse by others. Lack of know-how in anyone makes for dependence upon those who have it. The better one communicates with his fellows, the more chance he has for a good life.

The following purposes emphasize the skills that pupils of the Modified General Program of Instruction should acquire within the framework of usual school subjects. This is not meant to imply that these purposes are limited to an individual subject area. The teacher is encouraged to correlate these skills whenever possible.

English

To improve skills of reading

To believe that one can learn to read

To enjoy and use what is read

To improve oral and written expression

To acquire a degree of freedom in speaking

To enjoy speech and to use it to advantage

To share experiences and communicate ideas through writing and speaking

To feel that one wants to express one's ideas and feelings

To see the advantages of imaginative expression

To record observations

To improve legibility of handwriting

To develop reasonable skills in spelling

To be responsible for spelling in written work

Social Studies

To grow in understanding of one's self

To grow in understanding of the rights, privileges, and duties of a citizen in a democracy

To grow in attitudes of interest, alertness, and sympathetic understanding of all peoples

To appreciate the likenesses and differences of groups

To participate in group and class activities

To locate and gather information

To gain basic facts, as many as may be possible, about countries and government, local, state, and federal

To gain a listening knowledge of names, places, and facts by using the press, radio, and television

To complete an assigned task promptly, carefully, and with one's best effort

Science

To understand and to appreciate one's physical environment

To respect, understand, and live well with others at home and elsewhere in one's environment

To develop interest and skill in worth-while leisure-time activities

To develop the knowledge, skills, attitudes, and understanding essential for earning a living

To develop consumer effectiveness

To assume responsibility for the care of plants and animals

To develop attitudes and habits of good personal health

To plan and complete simple observations, records, and measurements

Mathematics

To extend mastery of fundamental arithmetic processes

To develop the ability to reason in quantitative situations and to secure correct solutions to problems

To develop skill in using mathematics as the need arises

To develop an understanding of the basic concepts of mathematics

To extend ability to make dependable estimates and approximations

To learn to derive the greatest good from available economic resources

To extend understanding of measures and to develop facility in using common tools of measurement

To learn to read, interpret, and use scales in scale drawings, maps, and models

To gain knowledge of commonly used geometric figures and their properties

To increase understanding of graphs and facility in reading, interpreting, and constructing simple graphs

To recognize, understand, interpret, and use formulas in solving problems

To develop precision and accuracy in expressing quantitative information

To appreciate the significance of mathematics in modern life

Evaluation

Evaluation of progress for the pupil in the Modified General Program of Instruction must involve a kind of interpretation different from that traditionally employed by teachers. The following principles are useful:

Objectives and standards set up must be kept within pupil reach.

Limited reliance should be put upon the results of written tests.

Observational techniques used by all teachers to gain an understanding of the extent of improvement in the work of their pupils apply as well as simple formal tests in the evaluation process for these less able pupils.

Teacher opinion based on intangible clues must play a large part in the evaluation of the growth of less able pupils in skills, attitudes, and understandings.

Of particular importance to teachers of pupils in the Modified General Program of Instruction are evaluation procedures considered under these three headings: evaluation by the pupil of his own work, evaluation by the class of individual and group work, and evaluation by the teacher.

The pupil should be encouraged to build upon his own past record of achievement. A chart or check list upon which growth in certain desired areas can be shown may be prepared by each pupil to check his own personal progress. It is important that pupils see the results of their efforts. Teachers need to be aware that this type of approach to evaluation consumes time.

When given in the spirit of helpfulness and good will, evaluation through constructive group criticism of individual and classroom endeavors is of value to all concerned. The class can be of great help to the individual pupil. Group criticism, however, can be a threatening experience and should be used carefully and infrequently. After several negative experiences, many pupils will quit trying to achieve.

The part of the teacher in the evaluation process gains validity as he learns to know the pupils better and establishes reasonable goals and objectives for them. The pupil who is putting forth his best effort should seldom be graded so low as to produce discouragement and indifference, or so high as to give him a false idea of his own skills and accomplishments. Evaluation can be related directly to the performance of specific tasks by the pupil in the classroom.

It has been the experience of some teachers of the Modified General Program of Instruction that individual assignments are improved and can be evaluated more equitably if they are planned for completion within a single class period. Many teachers make each class meeting, as nearly as possible, a complete unit of instruction, or a complete phase of a larger topic. This procedure brings greater success because of the variation in ability among the pupils, the high rate of absence and the characteristic inability of the pupils to take care of materials and to organize their work. It is desirable that the pupil be helped to see the connection between the current lesson and previous lessons.

Testing is normal, necessary, and expected by all pupils. In this program the teacher needs to use a great variety of simple tests and to use them frequently. Teachers have found, for example, that a short written exercise given within the same class period on the topic under discussion is preferable to a quiz delayed until the next class period. Emphasis should be on successes rather than failures. These pupils are accustomed to failure. The inability to realize desirable goals should be discussed frankly in such terms and not merely reported by the recording of low marks.

In the final analysis, successful teaching of pupils in the Modified General Program of Instruction depends to a great extent upon the sensitivity of the teacher to the characteristics and needs of these pupils. This curriculum bulletin focuses attention on an important program in the Cincinnati Public Schools and offers a line of direction to the teachers involved.

Part II

TEACHING MATHEMATICS TO THE MODIFIED GENERAL PUPIL

Understanding

It is important to remember that abstraction in mathematics is difficult, but that understanding must be present for retention. Temporary successful imitation is not a worthy goal since only what pupils know and can apply after they leave school has value to them. Hence mathematical understanding as well as practical application of skills and concepts must be stressed.

Use of Study Guides

In Modified General classes attendance may be irregular and inconsistent. There is often great mobility among the pupils enrolled, so that the membership of the class may change. It is wise, therefore, to make each lesson self-contained so that after a pupil has been absent, he can still participate on the day he returns. An experienced teacher selects a short topic daily and provides sufficient repetition and carefully graduated steps of difficulty in subject matter until each particular process is taught. It is important to the pupil to find something he can master in each lesson.

The committee found no mathematics textbook which met all the needs of pupils in Modified General classes. The adopted textbooks do have some material that can be tailored to the level of achievement of these pupils. Textbooks which do contain appropriate materials are available. These texts, which contain easier material than is associated with the junior high school, are available without grade level indication. Instead, each grade level has a different title. The titles are listed in the Supplementary Books List. (The requisition must specify that books without printed grade levels are required.) Consequently, an eighth grade pupil who is two years retarded in

SUPERVISED STUDY IS ESSENTIAL IN THIS PROGRAM achievement can use a sixth grade book without feeling inadequate. This easier material is helpful but it is understandably not written with the interests of junior high school pupils in mind.

Many teachers in the Modified General Program use study guides similar to the samples included in this curriculum bulletin. The guides contain simple directions, they deal with self-contained topics, they provide fifteen to twenty minutes of practice, and when possible, they help a pupil discover a process for himself.

A well-planned lesson includes time for practice on the new skill or idea within the class period. An average of fifteen to twenty minutes should be allotted to this daily. The study guide is a source of practice material. The pupils may be directed to do as many as possible of certain specified examples as they work at their desks. At this time the teacher may move about the room giving individual help where it is needed. Since pupils like immediate assurance that they are proceeding correctly, some teachers check individually as many of the study guides during the class period as time permits.

If some pupils finish the study guide or assigned work early, they may be good tutors for those who need some assistance. The slower ones are helped and the faster ones learn to be articulate about the understandings basic to their skills.

Good Class Planning

Good class planning provides study guides as only one part of a typical class period. The short attention span of the pupils in the Modified General Program of Instruction requires variety in classroom work. The teacher must plan carefully to include different kinds of procedures such as class discussion, pupil demonstrations, board work, and study guides, as well as arithmetic games, filmstrips, films, diagrams, models, and other extra-sensory aids. A variety of different types of activity should be provided during each class period so that pupils are not required to spend the entire time listening, or discussing, or writing.

If many pupils appear to need help, teachers may use supervised group practice at the board. As many as can conveniently work there are sent to the chalkboard, problems are given orally by the teacher and solved by those at the board and also by those at their desks. The teacher should stand in a spot from which all the pupils at the board can be seen and should direct pupils who complete the solution to stand aside and wait for the teacher's nod as a signal that the work may be erased. Sometimes a pupil who is seated at his desk may give the correct answer. It is important that all pupils take part. It may not be efficient to wait for all the pupils to complete the problem. Instead, after a reasonable time, the teacher may have all the pupils examine a correct solution that remains on the board. Those who made mistakes should be helped in finding them and in correcting the cause. This procedure enables a teacher to observe many pupils at the same time. It is desirable when a new process or type of problem is being taught. It is also an excellent way to prepare a class for a subsequent study assignment.

Displays of pupil projects and work well done provide opportunity for creativity on the part of class members and reflect the learning which is currently taking place. Concrete materials should always be available to help establish meaning in the mathematics classroom.

The need for security on the part of the pupils requires that routine classroom activities be well organized and regularly attended to in the same way each day.

Motivation

Motivation is one of the major problems in teaching mathematics to pupils in the Modified General Program. They find long chains of deductive reasoning and abstractions too demanding. They can and do respond to lessons which are interesting, which are based on concrete presentations, and which are within their experiences and needs. Teachers should try many approaches and devices that will help motivate pupils. Some of the effective means are:

Attractive bulletin boards and rooms

Displays of pupil work

Praise for work well done

Language which the pupil can understand and which is on his level of interest

Concepts developed through the use of topics which are of value to the learner and within his immediate experience

Acceptance by the teacher of the dignity and worth of each member of the group

Enthusiastic interest of the teacher in both the subject matter and the pupil

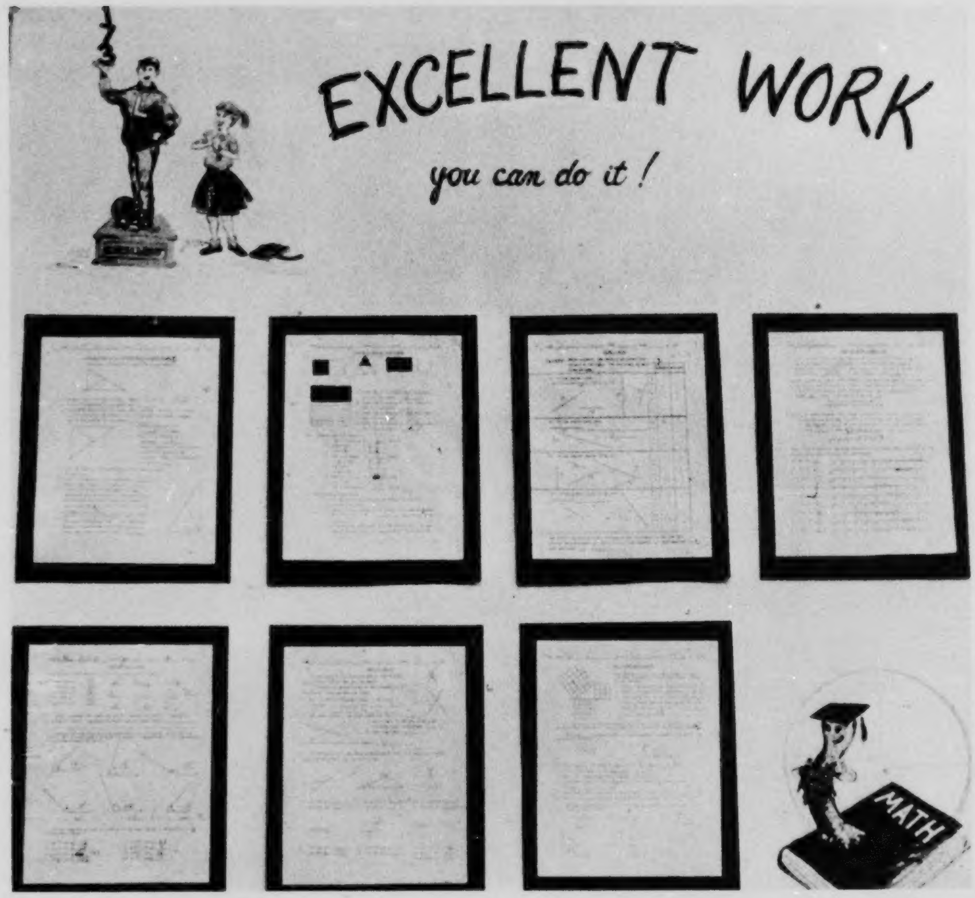
Patience, understanding, and willingness on the part of a teacher to stay with a presentation until the pupils understand

Ingenuity in producing simple explanations in different words and from different points of view instead of merely repeating an unsuccessful presentation

Work organized so that pupils enjoy frequent success.

Reading

Teachers of mathematics must also improve the reading ability of pupils. Learning to read for information is basic to all the subject areas. To avoid reading because the pupil cannot perform well is evading the problem. Since many secondary school teachers are not trained in teaching reading, some suggestions may be helpful.


EXCELLENT WORK
you can do it!
MATH

MOTIVATION IS THE CHALLENGE OF THE PROGRAM

Reading aloud by a class member, or by the teacher, may defeat the purpose entirely. The result is that the pupils are then not required to read the directions or problems for themselves or even to listen to the reading. It may be more effective to ask the pupil to read the problem or material to himself. Then the teacher may ask about the pronunciation and meaning of specific words which appear to be difficult. Another pupil may be asked to state in his own words what the material or problem says. Another may tell, with his book closed, the facts that are provided if a thought problem is involved. Experienced teachers continue to check reading by having the pupil interpret in his own words what he gets from the printed page. Often interpretation comes through a diagram which the reader sketches to symbolize the meaning. As the pupils learn to read directions and explanations, less guidance will be needed by the teacher. Only rarely is it advisable for a teacher to assign out-of-class reading to a Modified General class.

Evaluation in Mathematics

As the teacher studies the progress of his pupils, he uses a variety of observational techniques. He observes the pupils as they work, questions the processes they use, asks for descriptions of the steps in their thinking, and is alert to their participation in classroom discussions. He notes the way they attack a problem and how they apply what they know to new situations.

Pupils in the Modified General Program are at least two years over age. They are familiar with failing marks. Whatever motivation these symbols may have for some pupils, they appear to have lost their power to inspire Modified General pupils to increased scholastic effort. In many cases, the accumulated failures appear to have caused them to develop a resistance to learning. It is well to remember that the Modified General groups are labeled on office records, and transcripts. Evaluating the work of a pupil enrolled in this program with a mark that seems best for the ultimate success of the pupil seems the best criterion which can be used.

Pupils learn best when they are relaxed and unafraid. The confidence of the enthusiastic teacher is contagious, and as he finds pleasure in teaching, he will encourage pupils to find pleasure in learning.

SELECTED TEACHER REFERENCE BOOKS

FROM SUPPLEMENTARY BOOKS LIST

CODE	AUTHOR	TITLE AND DATE	READING LEVEL	GRADE OR USE	UNIT PRICE
0168-501	Banks	Learning and Teaching Arithmetic, 1959	TR	K-9	4.47
6156-680	Bendick	Take a Number, 1961	5	4-9 MG	1.95
9473-150	Brandes	A Collection of Cross Number Puzzles, T.E., 1957	T	7-9	2.50
7806-485	Cutts	Teaching the Disorderly Pupil in the Elementary and Secondary School, 1957	TR	T	1.52
5641-462	Gundlach	The Laidlaw Glossary of Arithmetical-Mathematical Terms, 1961	8	6-9	.69
6801-147	Johnson	Commercial Games for the Arithmetic Class (Reprint from Arithmetic Teacher, March 1, 1958) 1958		4-6	.20
8236-258	Larsen	Enrichment Prog. for Arithmetic, Grade 3 (8 Titles), 1956	3	7-MG	1.20
8236-261		Enrichment Prog. for Arithmetic, Grade 4 (8 Titles), 1956	4	8-MG	1.20
8236-263		Enrichment Prog. for Arithmetic, Grade 5 (8 Titles), 1956	5	8-MG	1.20
8236-266		Enrichment Prog. for Arithmetic, Grade 6 (8 Titles), 1956	6	9-MG	1.20
6156-681	Marks	Teaching Arithmetic for Understanding	TR	K-8	4.87
4775-875	Swain	Understanding Arithmetic, 1957	TR	K-9	3.80

For a more complete listing of titles see the Supplementary Books List

BOOKS FOR USE IN THE MODIFIED GENERAL PROGRAM

FROM SUPPLEMENTARY BOOKS LIST

Materials for Purchase in Sets of Twelve

CODE	AUTHOR	TITLE AND DATE	READING LEVEL	GRADE OR USE	UNIT PRICE
4775-525	Brueckner	New Exploring Numbers, 1959	5	M.G.	2.19
4775-530		...Same Answer Book			.30
4775-570		New Understanding Numbers, 1959	6	M.G.	2.19
4775-575		...Same Answer Book			.30
4775-560		New Thinking with Numbers, 1959	7	M.G.	2.19
4775-565		...Same Answer Book			.30
		(Specify no numeral on the book when ordering)			
8486-706	Hartung	Seeing Through Arithmetic Grade 4 1956	4	M.G.	2.01
8486-751		...Same TM			1.92
8486-713		Seeing Through Arithmetic Grade 5 1956	5	M.G.	2.01
8486-753		...Same TM			.99
8486-708		Seeing Through Arithmetic Grade 6 1956	6	M.G.	2.01
8486-710		...Same TM			.99
4026-167	Marks	Exploring Mathematical Ideas, 1961	4	M.G.	1.00
4026-124		Enlarging Mathematical Ideas, 1961	5	M.G.	1.00
4026-173		Extending Mathematical Ideas, 1961	6	M.G.	1.00
7806-339	Peters	Going Places with Mathematics, 1956	7	7-9 M.G.	2.94

A SUGGESTED OUTLINE OF CONTENT FOR THE MODIFIED GENERAL PROGRAM OF INSTRUCTION IN MATHEMATICS

Grades 7, 8, 9

In the estimate of the curriculum committee, the content outline represents the best grade placement of topics of instruction, but in some classes pupils may be found who must proceed even more deliberately. Teachers know their own classes and should proceed in accordance with their own considered judgment.

Sample study guides have been prepared for selected topics in the content outline. These study guides are placed after the content outline in this bulletin. In the content outline, the numbers of the study guides are printed to the right of the topic they help teach. The study guides are numbered according to the suggested grade level and sequence within the grade level. Guides numbered in the 100's are suggested for the seventh grade, the 200's, for the eighth grade, and the 300's, for the ninth grade. If, in the judgment of the teacher, his class will derive benefit from a guide proposed for a different grade level, he may wish to confer with a mathematics supervisor about its use.

At the beginning of each grade level section there is included a sample lesson plan designed to accompany the first study guide of the series. These lesson plans are included to help new teachers with the pre-planning that is necessary for the effective use of a study guide with pupils.

WHOLE NUMBERS

Grade 7	Grade 8
Reading and writing whole numbers to hundred thousands	Reading and writing whole numbers Extend to millions
Rounding whole numbers nearest 100; 1,000	Rounding whole numbers nearest 10; 1,000,000
	Writing whole numbers in words 2 to 3 digits
Numeration system decimal place value special characteristics of zero and one	Numeration system characteristics even and odd numbers multiples of 10, 5 prime numbers (1 to 100)
Addition of whole numbers concept addition facts column addition (to 4 addends, 2 digits) 3 addends, 3 digits) applications from experience	Addition of whole numbers concept addition facts column addition extended applications extended
Subtraction of whole numbers concept subtraction facts changing (borrowing) zero difficulties applications from experience	Subtraction of whole numbers concept subtraction facts changing zero difficulties applications extended
Multiplication of whole numbers concept multiplication facts 2-place multipliers (factors) placement of partial products applications from experience	Multiplication of whole numbers concept multiplication facts 2 and 3-place multipliers (factors) applications extended

WHOLE NUMBERS

Grade 9	Study Guides on this Unit
Reading and writing whole numbers Extend to billions	102
Rounding whole numbers to nearest required unit	101
Writing whole numbers in words on bank checks	
Numeration system characteristics comparison with Roman system comparison with Quinary system prime numbers (1 to 100)	202 308
Addition of whole numbers concept addition facts column addition extended applications	103, 104, 105 201, 203, 204 301, 302, 309
Subtraction of whole numbers concept subtraction facts changing zero difficulties applications extended	106
Multiplication of whole numbers concept multiplication facts 3-place multipliers (factors) powers of numbers applications extended	108 205,209

WHOLE NUMBERS (Continued)

Grade 7	Grade 8
Division of whole numbers concept division facts meaning of remainder estimating number of digits in a quotient 1 and 2-place divisors apparent quotient correct factors of a number applications from experience Review of whole numbers	Division of whole numbers concept division facts meaning of remainder express as a remainder express as a fraction estimating number of digits in a quotient 2-place divisors, extended difficulty (quotient not apparent, zeros in quotient) factors of a number applications extended
Characteristics of operations order may be reversed in + and x inverse operations: + and - inverse operations: x and + use of these characteristics in computation and checking	Characteristics of operations order may be reversed in + and x grouping numbers for addition inverse operations: + and - inverse operations: x and + use of these characteristics in computation and checking
Review	Review
Vocabulary sum, difference, factor, product, divisor, dividend, quotient, even, odd, round number, digit, numeral, decimal point	Vocabulary multiple, common multiple prime number

WHOLE NUMBERS (Continued)

Grade 9	Study Guides on this Unit
Division of whole numbers concept division facts meaning of remainder express as a remainder express as a fraction estimating number of digits in a quotient 3-place divisors, extended difficulty factors of a number applications extended simple ratio	109, 110 207, 208
Characteristics of operations order may be reversed in + and x inverse operations: + and -; x and ÷ use of these characteristics in computation and checking	107, 111
Review	112, 206, 303, 307
Vocabulary prime, ratio	

COMMON FRACTIONS

Grade 7	Grade 8
Understanding fractions concrete presentation reading and recognition writing meaning significance of numerator and denominator relative sizes of fractions concept of different fractional names for the same number simplest form	Understanding fractions concrete presentation reading and recognition writing different fractional names for the same number simplest form significance of numerator and denominator relative sizes of fractions ratio
Operations with fractions fractions with like denominators (halves, fourths, eighths, perhaps thirds, sixths) first steps in addition and subtraction of simple fractions and mixed numbers multiplication of a whole number and a fraction division of a whole number by a unit fraction applications from experience review	Operations with fractions addition and subtraction of related fractions such as 1/3's and 1/6's, also simple unrelated types such as 1/2's and 1/3's and mixed numbers where regrouping is necessary multiplication of fractions division of whole numbers and simple mixed numbers by fractions applications extended
Vocabulary numerator, denominator, common factor, common denominator, common multiple, simplest form, mixed number, reciprocal	Vocabulary divisor, ratio

COMMON FRACTIONS

Grade 9	Study Guides on this Unit
Understanding fractions	113, 115, 116
concrete presentation	
reading and recognition	210
writing different fractional names for the same number	
significance of numerator and denominator	
relative sizes of fractions	
simplest form	
recognizing a fraction as a ratio, as an indicated division	
Operations with fractions	114, 117, 118, 119, 120, 121, 122, 123, 133
addition and subtraction of fractions extended	211, 212, 213
multiplication of fractions extended	306, 311
division of fractions extended	
applications extended	

DECIMAL FRACTIONS

Grade 7	Grade 8
Understanding decimal fractions decimal fractions in our numeration system invention of decimal point place value of positions to right of decimal point reading decimal fractions (to hundredths) writing decimal fractions and mixed decimal numbers (to hundredths) use of decimal fractions in money rounding decimal fractions nearest tenth, hundredth recognizing decimal fraction equivalents of 1/4, 1/2, and 3/4	Understanding decimal fractions decimal fractions in our numeration systems significance of decimal point place value of positions reading decimal fractions thousandths writing decimal fractions and mixed numbers (extended) rounding decimal fractions (extended) decimal fractions in money rounding to nearest 10 cents recognizing common fraction and decimal fraction equivalents
Operations with decimal fractions related to operations with common fractions addition and subtraction (hundredths)	Operations with decimal fractions related to operations with common fractions addition and subtraction extended to thousandths multiplication and division of decimal fractions by whole numbers (money situations) and decimal fractions
Review	Review
Thought problems	Thought problems
Vocabulary tenths, hundredths, place value, equivalent fractions	Vocabulary thousandths

DECIMAL FRACTIONS

Grade 9	Study Guides on this Unit
Understanding decimal fractions	125, 126
decimal fractions in our numeration systems	215
significance of decimal point	
place value of positions	
reading decimal fractions	
thousandths	
writing decimal fractions and mixed numbers (extended)	
rounding decimal fractions (extended)	
decimal fractions in money	
rounding to nearest cent	
Review	
Operations with decimal fractions	124, 136
related to operations with common fractions	216, 217, 218, 220
addition and subtraction extended to thousandths	
multiplication and division of decimal fractions by decimal fractions (and mixed numbers)	
changing common fractions to decimal fractions (and the reverse for frequently used forms as halves, thirds, fourths)	
Review	221, 225 304, 305, 307
Thought problems	214, 222 310, 312, 313, 315, 321
Vocabulary	
ten-thousandths	

PERCENT

Grade 7	Grade 8
Meaning ratio equal ratios	Meaning equal ratios multiplication by $\frac{1}{100}$ or .01
Writing percents as common or decimal fractions	Other names for percent Memorization of common equivalents
Kinds of problems finding a percent of a number	Kinds of problems finding a percent of a number
	Applications of percent interest percent of increase and decrease commission discount
Vocabulary ratio, percent Note: Authority can be found for each spelling: per cent and percent. The trend seems to be in the direction of percent as used in this outline, but both forms are accepted.	Vocabulary part, base, rate, interest, principal, gross, net, annually

PERCENT

Grade 9	Study Guides on this Unit
Meaning	127, 128
equal ratios	223
multiplication by $\frac{1}{100}$ or .01	316, 317
Other names for percent	129, 130
Memorization of common equivalents (extended)	314
Kinds of problems	131
finding a percent of a number	224, 225
finding what percent one number is of another	316, 317, 320
Applications of percent	226, 227
taxes	
percent of increase and decrease	312, 314, 318, 319, 321
depreciation	
budgets	
simple interest	
compound interest	
commission	
discount	
insurance	
mortgage	
Vocabulary	
budget, deductions, semiannually, quarterly, amount, compound interest	

MEASUREMENT

Grade 7	Grade 8
History early measures importance of standards Importance of measurement	History early measures development of standards modern need for precision Importance of measurement
Linear measure definition units and relationships inch, foot, yard, mile measuring instruments ruler, yardstick, tape estimation	Linear measure definition units and relationships inch, foot, yard, mile, meter measuring instruments ruler, yardstick, tape estimation
Liquid measure (household) units and relationships teaspoon, tablespoon, cup, pint, quart, gallon estimation Weight measure units and relationships ounce, pound estimation	Liquid measure contrasted with dry measure include fluid ounce and relationship with pint estimation Weight measure units and relationships ounce, pound, ton estimation
Temperature measure unit used special points on the scale	Temperature measure unit used special temperatures below zero measures

MEASUREMENT

Grade 9	Study Guides on this Unit
History importance of standards precision tolerance approximation Importance of measurement	
Linear measure American system metric units and relationships meter centimeter kilometer (no conversion factors) estimation	132 229
Liquid measure metric unit - liter, cc. imperial gallon (5/4 of one gallon) commercial can sizes estimation Weight measure include metric units gram kilogram (no conversion factors) estimation	
Temperature measure compare F and C scales and note critical points below zero as negative numbers	230
Surface measure concept of surface measure squares $A = s^2$ rectangles $A = lw$ parallelograms $A = lw$ triangles $A = \frac{bh}{2}$ circles $A = \pi r^2$	325, 326, 331

MEASUREMENT (Continued)

Grade 7	Grade 8
Time measure units and relationships hour, day, month, year reading the clock and calendar estimation	Time measure units and relationships hour, day, month, year, minute, second reading the clock and calendar time zones estimation
Denominate numbers reading and writing addition and subtraction	Denominate numbers addition and subtraction
	Scale drawing reading and interpreting making simple scale drawings
Review	Review
Vocabulary linear standard unit of measure Fahrenheit denominate number	Vocabulary fluid ounce scale

MEASUREMENT (Continued)

Grade 9	Study Guides on this Unit
Volume understanding the concept of cubic measure cube $V = s^3$ rectangular prism $V = lwh$ cylinder $V = \pi r^2 h$	335
Angle measure understanding the unit and what is measured using the protractor estimation	235
Time measure units and relationships hour, day, month, year, minutes, seconds reading the clock and calendar time zones estimation	134
Denominate numbers multiplication and division	
Meter reading gas and electric meters	
Scale drawing and scale models reading and interpreting making simple scale drawings and models use in indirect measure	231
Review	133 228
Vocabulary tolerance approximation Centigrade protractor	

INFORMAL GEOMETRY

Grade 7	Grade 8
Historical background Geometry in the environment	Historical background Geometry in the environment
Kinds of lines curved straight	Lines associated with circles radius, diameter chord, arc
Position of lines vertical horizontal	Position of lines parallel intersecting perpendicular
Identification of plane figures triangles quadrilaterals rectangle square circles	Identification of plane figures triangles quadrilaterals parallelogram rectangle square circles
Perimeters of plane figures triangles quadrilaterals	Perimeters and areas of plane figures triangles quadrilaterals

INFORMAL GEOMETRY

Grade 9	Study Guides on this Unit
Historical background Geometry in the environment	
Lines associated with circles and polygons base, altitude, diagonal, angle bisector, median, perpendicular bisector	233, 234 339
Position of lines parallel, intersecting, perpendicular bisector Construction with straight edge and compasses	
Identification of plane figures angles acute, right, obtuse complementary supplementary adjacent vertical triangles equilateral acute isosceles right scalene obtuse quadrilaterals parallelogram trapezoid rectangle square other polygons pentagon hexagon	322, 323, 324, 327, 328, 329, 330
Perimeters and areas of plane figures triangles quadrilaterals regular polygons of 5 and 6 sides parallelogram trapezoid	232 325, 326

INFORMAL GEOMETRY (Continued)

Grade 7	Grade 8
	Circle chord circumference
Characteristics of plane figures rigidity of triangles structural weakness of quadrilaterals value of circle in transportation and containers	Characteristics of certain plane figures rigidity, regularity symmetry same shape and size (congruence)
Familiar angles square corner half turn and complete turn	Angles right angles straight angles introduction to protractor
	Solids characteristics identification cube rectangular solid cylinder sphere

INFORMAL GEOMETRY (Continued)

Grade 9	Study Guides on this Unit
Circle circumference degrees	233, 234
Characteristics of certain plane figures relationships of sides and angles same shape and size (congruence) similarity polygons classification triangles equilateral, isosceles, right, acute, obtuse medians, hypotenuse quadrilaterals parallelogram, rectangle square hexagon constructions	322, 323, 339
Angles skill in angle measurement sum of the angles of a triangle, quadrilateral construction of angles with straight edge and compasses right angles, 60° angle copy a given angle bisect a given angle (Refer to plane figures)	235 327, 328, 329, 330
Solids characteristics identification surface area and volume cube $S = 6e^2$; $V = e^3$ rectangular solid $S = 2lw + 2lh + 2wh$ $V = lwh$ cylinder	331, 335

INFORMAL GEOMETRY (Continued)

Grade 7	Grade 8
Vocabulary	Vocabulary
straight and curved lines	parallel
line segment	intersecting
vertical	perpendicular
horizontal	protractor
triangle	perimeter
quadrilateral	chord
rectangle	circumference
square	right angle
circle	symmetric
octagon	altitude of a triangle
	base
	parallelogram
	cube
	cylinder
	sphere

INFORMAL GEOMETRY PROVIDES OPPORTUNITIES
FOR DISCOVERY OF RELATIONSHIPS

INFORMAL GEOMETRY (Continued)

Grade 9	Study Guides on this Unit
Vocabulary polygon diagonal arc bisector acute and obtuse angles complementary angles supplementary angles adjacent angles vertical angles trapezoid isosceles equilateral pentagon, hexagon median edge	

GRAPHS

Grade 7	Grade 8
Understanding purposes of graphic presentation	Understanding purposes of graphic presentation
Recognition of kinds of graphs in wide use pictograph bar line	Recognition of kinds of graphs in wide use pictograph bar line divided bar circle
Reading and interpreting simple pictographs and bar graphs characteristics of well made graphs purpose of each kind of graph how information is conveyed reading trends drawing valid conclusions	Reading and interpreting bar and line graphs characteristics of well made graphs purpose of each kind of graph how information is conveyed reading trends drawing valid conclusions
	Construction of simple bar and line graphs review how to round numbers and prepare a scale
	Review characteristics of a well made graph
	Recognition of improper uses of graphic presentation
Vocabulary bar graph, horizontal scale, line graph, pictograph, vertical scale	Vocabulary circle graph, data, divided bar graph

GRAPHS (continued)

Grade 9	Study Guides on this Unit
Understanding purposes of graphic presentation	
Recognition of kinds of graphs in wide use pictograph bar line divided bar circle	
Reading and interpreting bar, line, divided bar, and circle graphs	135
Selecting the appropriate type of graph for certain given data	
Construction of bar, line, divided bar, and circle graphs review how to round numbers and prepare a scale	236
Review characteristics of a well made graph	
Recognition of improper uses of graphic presentation	
Additional topics square roots Pythagorean theorem negative numbers	332, 333, 334, 336, 337, 338
	50

STUDY GUIDES

The logic of arithmetic requires that operations with numbers be taught in sequence since the more difficult or complex processes such as long division demand previous mastery of the skills basic to them. Except for this restriction, the teacher is free to determine which topics will interest his pupils most at a given time. He may select from the appropriate study guides as his best judgment dictates, and adapt these to his class as he finds opportunities. The study guides presented here are not intended to cover every topic. The teacher may find that some of the guides are not useful in his class and that he prefers to produce his own as the occasion arises.

The study guides are designed to be used at the end of the class period to determine whether a concept has been taught successfully. Thus, a teacher must be certain that pupils are ready for independent work on this new idea, that the new idea has been presented and discussed, and that some practice has taken place before the study guide is placed in the pupils' hands.

The study guides are intended to help, not to restrict teachers. It is hoped that the guides will suggest ideas to teachers as they develop additional materials and plan other activities for their pupils.

Some of the guides involve rather difficult concepts and developments which have restricted application. They are included for the benefit of the limited number of pupils for whom teachers wish to provide increased challenge and motivation for practice in fundamental skills in a different setting. This list includes such guides as the following: 308, 320, 321, 326, 333, 334, 339.

A list of the study guides follows.

INDEX

Seventh Grade Study Guides

NO. TITLE PAGE
101 Rounding Whole Numbers 63
102 Our System of Numeration 64
103 Addition 65
104 Addition 66
105 Place Value and Addition of Whole Numbers. 67
106 Regrouping in Subtraction. 68
107 Inverse Operations (Addition and Subtraction). 69
108 Multiplication of Whole Numbers. 70
109 Division 71
110 Inverse Operations (Multiplication and Division) 72
111 Operations and Mathematical Sentences. 73
112 Review of Whole Numbers (Cross Number Puzzle). 74
113 Pictures of Fractions (Parts of a Whole) 75
114 Common Fractions (Addition). 77
115 Writing Fractions in Simplest Form 78
116 Different Numerals for the Same Number 79
117 Multiplication of a Whole Number and a Fraction. 80
118 Multiplication of a Whole Number and a Mixed Number. 81
119 Dividing by Fractions. 82
120 Reciprocals. 83
121 Everyday Uses of Common Fractions. 84
122 Subtraction of Fractions 85
123 Subtraction of Fractions 86
124 Making Change. 88

NO.	TITLE	PAGE
125	Decimal Fractions and Money.	89
126	Decimal Fractions.	91
127	Ratio.	92
128	Introduction to Percent.	94
129	Changing Numerals from Percent Form to Fraction Form . . .	95
130	Percents and Fractions May be Used to Name the Same Ratio.	96
131	Finding a Percent of a Number.	97
132	Using a Ruler.	99
133	Buying Food.	100
134	Time	101
135	Seating Capacity of Four Football Stadiums . . . . (Reading Bar Graphs)	102
136	The Space Age (Applications)	103

INDEX

Eighth Grade Study Guides

NO.	TITLE	PAGE
201	Odd and Even Numbers (Addition)	110
202	Systems of Numeration	111
203	Order in Addition	112
204	Grouping Numbers for Addition	113
205	Order in Multiplication	114
206	What Do You Know About Numbers (Review)	115
207	Factoring	116
208	More About Factoring	117
209	Common Multiples	118
210	Fractions and Ratios	119
211	Cooking (Applications with Fractions)	120
212	Getting Ready for Division of Common Fractions (Number Line)	121
213	Division of Common Fractions (Reciprocal)	122
214	Thought Problems (Applications with Money)	123
215	Rounding Decimal Fractions	124
216	Expense Accounts	125
217	Money Orders	127
218	Sales Tax	128
219	Multiplying Decimal Fractions	129
220	Estimation and Multiplication of Decimal Fractions	130
221	Season's Greetings	131
222	Buying Groceries	132
223	Percent	134
224	Finding a Percent of a Number	135

NO.	TITLE	PAGE
225	Drill for Saint Patrick's Day	136
226	Interest on Money	137
227	Paying Gas and Electric Bills	138
228	Measures (Cross Number Puzzle)	139
229	Metric Units of Measure (Linear)	140
230	Temperature	141
231	Reading a Scale on a Map	142
232	Perimeter and Area	144
233	Chords in a Circle	145
234	Circumference and Diameter of a Circle	147
235	Angle Measurement	148
236	Bar Graphs (Construction)	149

INDEX

Ninth Grade Study Guides

NO.	TITLE	PAGE
301	Buying the Family Automobile	155
302	Practice (All operations with whole numbers)	156
303	Finding the Value of Expressions	157
304	Mathematical Sentences 1	158
305	Mathematical Sentences 2	159
306	Earning Money	160
307	How Much Do You Know About Mathematics? (Review)	161
308	The Quinary Numeration System	162
309	Addition in the Quinary System	163
310	Buying in Quantities	164
311	Division of Fractions	165
312	Our Car	166
313	The Down Payment and Balance Owed When Purchasing a Car	168
314	Four Ways of Expressing the Tax Rate	169
315	Property Tax	170
316	Finding a Percent of a Number	171
317	Finding What Percent One Number Is of Another	172
318	The Family Budget	173
319	Interest	174
320	Watch Your Savings Grow (Compound Interest)	175
321	Automobile Insurance	176
322	Classification of Triangles by Sides	177
323	Classification of Triangles by Angles	178
324	Measure the Angles of These Triangles	179

NO.	TITLE	PAGE
325	Area of a Parallelogram	180
326	Area of a Trapezoid	182
327	Adjacent Angles	183
328	Vertical Angles	184
329	Complementary Angles	185
330	Supplementary Angles	186
331	Surface Area of a Box	187
332	Powers of Numbers	188
333	Estimating Square Roots	189
334	The Pythagorean Theorem	190
335	Volume	192
336	Opposite Numbers (Positive and Negative Numbers)	193
337	The Number Line and Negative Numbers	194
338	Addition on the Number Line	195
339	A Median Drawn to the Hypotenuse of a Right Triangle	196

STUDY GUIDES SUGGESTED

FOR

SEVENTH GRADE

LESSON PLAN TO ACCOMPANY 101

ROUNDING NUMBERS

Objectives

To establish reasons for learning to round numbers

To help pupils gain an understanding of the meaning of round numbers

To develop the pupil's skill in rounding numbers

To develop the pupil's ability to recognize rounded numbers.

Readiness Activities

Place value and positional characteristics of our number system

The number line

Related vocabulary

nearest
closer
approximate
exact

Suggested Classroom Activities

Talk about the number of pupils in the school by using questions such as:

a) How many pupils are enrolled?

b) Is this the exact number?

c) About how many pupils are in this class?

d) Is 30 a good number to indicate the size of the class?

Discuss other situations in which we ordinarily use rounded numbers such as:

number of teachers
number of boys
number of girls
game attendance

cost of new expressway, other local projects,
distance from earth to moon, sun, planets,
speed of satellites, guided missiles,
government income.

Tell what rounded numbers are and why we round them.

Draw a number line on the board and have pupils locate various numbers, asking after each location, which is it closer to -- 60 or 70? Then state, for example, "The number 67 rounds to 70."

Classroom Activities (continued)

a. Send pupils to the board to demonstrate to the class.

b. Use groups of pupils at the board while others work at their seats.

After several numbers have been rounded by the above method, see if pupils can use the method. Encourage them to think through each situation on a common-sense basis. Discourage the recital of rules and the use of mechanical procedures.

See page 9 in Learning to Use Arithmetic, Book Seven, Wren, et al, for practice exercises.

Use the study guide in directed study.

Suggested Techniques for Evaluation of the Lesson

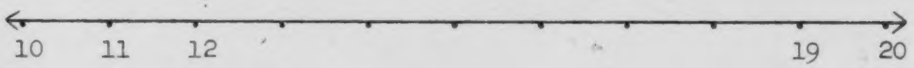
1. Observe pupil responses and questions during discussions.
2. Observe the work of pupils at the board.
3. Note the way pupils work at their seats: their approach to the problem, their successful use of techniques.
4. Check progress as pupils use the study guide.
5. Give a quiz on rounding 4 or 5 numbers. This exercise may be done on the back of the sheet.

NAME______________________ DATE ____________ SCORE ________ NO. 101

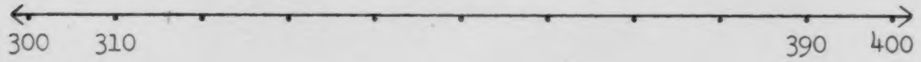
ROUNDING WHOLE NUMBERS

Each number line shown below is divided into 10 equal parts. Some of the points have been named. Under the other points, write their names.

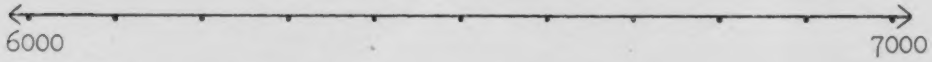
(1)



(2)



(3)

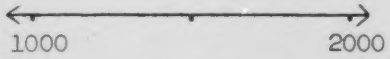


(4) What number is halfway between 10 and 20? _____ What number is halfway between 300 and 400? _____ What number is halfway between 6000 and 7000? _____

(5) The attendance at last night's ball game was about 20,000. Does this mean that there were exactly 20,000 people at the game? _________

(6) There are 28 cars entered in a cross country race. Does this mean exactly 28 cars? _______

A number like the "20,000" above is a "round" number. When the principal of a large school says there are about 3,000 pupils in his school does he mean exactly 3,000? ___________

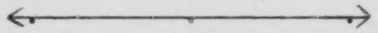


(7) What is the name of the number halfway between 1000 and 2000? ______ Write it where it belongs on the line.

(8) Decide where 1800 will be on the line. Mark it on the line above. Is 1800 closer to 1,000 or 2,000? ________ Should 1800 be rounded to 1,000 or 2,000? _________

(9) Decide where 1300 will be on the line. Mark it on the line above. Is it closer to 1,000 or 2,000? _____ Round 1300 to the nearest thousand. _______________

(10) Use the number line below to help you round 691 to the nearest hundred. What is 691 rounded to the nearest hundred? __________



(11) Use the number line in #10 to help you round 638 to the nearest hundred. What is 638 rounded to the nearest hundred? ___________

Draw number lines on the back of this paper to help you round the following:

(12) 48 to the nearest ten.

(13) 513 to the nearest hundred.

NAME____________________ **DATE**____________ **SCORE**________ **NO.** 102

OUR SYSTEM OF NUMERATION

In our system of numeration which is based on ten, we use only ten digits.

They are: 0 , 1 , ___, ___, ___, ___, ___, ___, ___, ___.

The position of the digit tells what multiple of ten it names. Study this chart so that you know what multiple of ten to use.

100,000	10,000	1000	100	10	1
10,000 x 10	1000 x 10	100 x 10	10 x 10	1 x 10	$\frac{1}{10}$ x 10
Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones

7 3 4 6 8 5___ means 5 x 1

means 8 x 10

means 6 x 100

means 4 x ___

means 3 x ___

means 7 x ___

EXAMPLE: 52 = 5 x 10 + 2 x 1 or 52 ones. We read it fifty two.

(1) 438 means 4 x ___ + 3 x ___ + 8 x ___ and is read in words ____

(2) 926 means 9 x ___ + 2 x ___ + 6 x ___ and is read in words ____

(3) 3,564 means 3 x ___ + 5 x ___ + 6 x ___ + 4 x ___ and is read in words ____________________________________

Expand these numerals on the back of your paper like the examples above, and write their names in words.

(4) 5,423 (6) 213,407 (8) 4,001

(5) 12,345 (7) 606,606 (9) 12,200

Write the following using digits:

(10) Four hundred seventy-six thousand, nine hundred twenty-three__________

(11) Eight thousand, two hundred ninety-four______________________

(12) Four thousand forty____________________________________

(13) Fifty-two thousand, four hundred twenty-nine__________________

If the numeral has 4 or more digits, groups of three digits starting at the right are marked off by commas. This is to help you read a numeral. Put commas in your answers in exercises 10 through 13.

Puzzle: Name the largest number you can make using only the digits 2, 4, and 9 ________ The smallest number ________

NAME______________________ DATE____________ SCORE________ NO. 103

ADDITION

In the world of today it is necessary to memorize the basic addition facts. Some people in other parts of the world still use beads on counting frames, but here we memorize all the simple totals. Write the totals below as quickly as you can think of them. You should be able to complete the set with no errors in 60 seconds.

If you make mistakes, hold yourself responsible for learning the correct response and try again until your score is perfect.

2	3	6	5	9	8	7	6	8	5
2	9	8	7	4	5	7	5	9	2
8	9	3	9	5	4	3	9	3	7
7	6	3	7	4	7	8	9	3	6
5	4	5	7	2	4	6	4	6	3
9	8	5	3	8	4	3	3	2	5
6	7	8	2	9	5	7	6	4	7
6	9	8	3	2	5	2	4	2	8

When numbers are added, the answer is called the sum of the numbers.

1. What is the sum of 8 + 0?_____ of 23 + 0?_____ of 55 + 0?_____
2. What is the sum of 9 + 0?_____ of 643 + 0?_____ of x + 0? _____

Complete the following:

3. 7 + 5 = _____ 17 + 5 = _____ 57 + 5 = _____ 37 + 5 = _____
4. 8 + 6 = _____ 28 + 6 = _____ 88 + 6 = _____ 48 + 6 = _____
5. 9 + 8 = _____ 39 + 8 = _____ 59 + 8 = _____ 79 + 8 = _____
6. 9 + 23 = _____ 9 + 33 = _____ 9 + 43 = _____ 9 + 53 = _____
7. 5 + 0 = _____ 7 + 0 = _____ 0 + 0 = _____ 1 + 0 = _____
8. 9 + 83 = _____ 63 + 9 = _____ 9 + 13 = _____ 33 + 9 = _____

Here are some puzzles:

9. Fill in the blanks with numbers no larger than 9 so that the following sentences will be true.

   _____ + _____ = 18 _____ + _____ = 17 _____ + _____ = 16

10. 79 + _____ = 82 9 + _____ = 52 9 + _____ = 22 9 + _____ = 62

NAME ______________ DATE __________ SCORE ________ NO. 104

ADDITION

After you know your basic addition facts you are ready to add more numbers and larger numbers.

Numbers are always added two at a time. In a long column you add two numbers and then add the next one to this sum.

Example: 4 + 9 + 6 + 8 =

Think: 4 + 9 = 13; 13 + 6 = 19; 19 + 8 = 27

Notice that you carried the 13 and 19 in your mind and wrote only the final total 27.

Practice:

1. 8 + 6 + 5 + 3 = ____ 2. 7 + 2 + 5 + 6 = ____ 3. 5 + 3 + 6 + 1 = ____

4.	5.	6.	7.	8.	9.
6	2	5	3	6	8
3	8	6	2	8	3
4	7	4	9	9	4
8	5	8	1	6	4

10.	11.	12.	13.	14.	15.
5	7	9	5	4	7
7	6	4	6	8	7
4	6	8	3	9	9
9	3	6	7	5	3
9	4	5	8	8	4

Check your work by adding the same problems again in the opposite direction.

How much money do you have in the problems below?

16. 1 quarter, 7 cents ____
17. 3 dimes, 6 pennies, 5 pennies ____
18. 8 pennies, 6 pennies ____
19. 4 dollars, 7 dollars ____
20. 5 quarters ____
21. 40 dimes ____
22. 3 dollars, 8 dollars ____
23. 1 dollar, 7 cents, 9 cents ____
24. 6 dollars, 9 dollars, 8 cents, 5 cents ____

When you add sums of money, keep dollars with dollars, and cents with cents. There are always two places at the right of the decimal point for cents. If the number of cents is less than ten cents, such as four cents or seven cents, a zero is written to the right of the decimal point: $.04 or $.07

25.	26.	27.	28.	29.
$.08	$.10	$.50	$2.70	$4.96
.05	.37	.30	3.69	.52
.06	.52	.20	1.20	3.01

NAME______________________ DATE__________ SCORE________ NO. 105

PLACE VALUE AND ADDITION OF WHOLE NUMBERS

When we add small numbers as in 4 + 7 + 5, we depend upon the facts we have memorized. When we add larger numbers as in 275 + 916 + 346 we also use the way we write numerals to help us. We use the idea of place value in our numerals.

We remember that 275 is 2 hundreds + 7 tens + 5 ones
916 is 9 hundreds + 1 ten + 6 ones
346 is 3 hundreds + 4 tens + 6 ones
___ hundreds + __tens + __ones

and we are careful to add all the ones, then all the tens and finally all the hundreds. Questions 1 to 6 below refer to this problem.

1. What is the sum of all the ones? __________
2. How many tens are there in this sum?__________
3. Since there is only a single place for the numeral which tells how many ones are in the total, what must you do with the ten? ______
____

   Did you say, "Add the ten from your 17 ones to the other tens in the tens column"?
4. What is the total in the tens column including the one ten from the total of the ones?____________
   What must you do with ten of these tens?__________________
5. What is the total of the hundreds including the one you carried?_____
6. What do you do with the ten hundreds in this total?____________
   The final answer is _____thousand + _____ hundreds + _____ tens + _____ones, which we write in numerals alone as ______________
7. $$\begin{array}{r}561\\478\\443\\\hline 1482\end{array}$$
   In the answer to the example at the left the digits mean:
   1 ____ + 4 ____ + 8 ____ + 2 ____

Add and be able to explain your work:

8. $\begin{array}{r}914\\207\\853\\\hline\end{array}$
9. $\begin{array}{r}185\\642\\921\\\hline\end{array}$
10. $\begin{array}{r}396\\240\\857\\\hline\end{array}$
11. $\begin{array}{r}843\\752\\639\\\hline\end{array}$
12. $\begin{array}{r}5283\\100\\97\\624\\\hline\end{array}$
13. $\begin{array}{r}928\\5\\26\\824\\\hline\end{array}$
14. 625 + 813 + 295 + 769 = ____
15. 1046 + 823 + 998 = ________

NAME ____________________ DATE ____________ SCORE ________ NO. 106

REGROUPING IN SUBTRACTION

Circle the numerals in the following rows which are names for the same number:

(1) [✓ 9 + 3]   9 x 3   [✓ 10 + 2]   [✓ 14 - 2]

(2) 6 + 4   5 x 2   5 + 2   10

(3) 30 + 2   3 x 10 + 2   2 x 10 + 12   36 - 2

(4) 5 x 10 + 3   4 x 10 + 23   4 x 10 + 13   60 - 5

Rewrite the following as directed:

(5) 28 = 20 + 8

(6) 33 = 20 + 13

(7) 81 = 70 + ____

(8) 57 = 40 + ____

(9) 66 = 50 + ____

(10) 182 = 170 + ____

(11) 233 = 100 + ____

(12) 41 = 3 x 10 + ____

(13) 94 = 8 x 10 + ____

(14) To subtract it is often necessary to change the way in which a numeral is written. In the example -- subtract 28 from 53, how can 8 ones be subtracted from 3 ones? It becomes necessary to change the way 53 is written to 40 + 13 and think of the 13 as thirteen ones. Complete the subtraction below.

$$\begin{array}{r c r}
53 & = & 40 + 13 \\
28 & = & 20 + \ \ 8 \\
\hline
\end{array}$$

Complete the following subtraction exercises:

(15)
$$\begin{array}{r c r}
81 & = & 70 + \underline{\quad\quad} \\
27 & = & 20 + \underline{\quad\quad} \\
\hline
\end{array}$$

(16)
$$\begin{array}{r c r}
96 & = & \underline{\quad\quad} + 16 \\
68 & = & 60 + \underline{\quad\quad} \\
\hline
\end{array}$$

(17)
$$\begin{array}{r}
428 \\
219 \\
\hline
\end{array}$$

(18)
$$\begin{array}{r}
562 \\
314 \\
\hline
\end{array}$$

(19) Bob had 83 cents when he came to school. He spent 49 cents for his lunch. How much does he now have? ____________________

(20) It is 562 miles to the vacation resort. The Browns have driven 438 miles. How far do they still have to drive? ________________

NAME________________ DATE__________ SCORE________ NO. 107

INVERSE OPERATIONS

There are many pairs of actions which undo each other. For example, "stop" and "go" undo each other. So do "open" and "close." Fill in the missing actions below with actions which undo the given ones.

a. untie ________ b. give ________ c. push ________

Apply this idea to these mathematical sentences:

	DO	UNDO		DO	UNDO
1.	4 + 5 = 9	9 - 5 = 4	11.	42 - 16 =	
2.	7 - 4 = 3	3 + 4 =	12.	21 - 7 =	
3.	5 + 1 = 6	6 -	13.	76 + 18 =	
4.	17 - 13 = 4	4 +	14.	915 - 732 =	
5.	12 + 12 =		15.	48 + 29 =	
6.	3 + 8 =		16.	8 - 8 =	
7.	15 + 6 =		17.	473 + 182 =	
8.	8 - 3 =		18.	163 + 1 =	
9.	61 - 4 =		19.	3 + n = 19	
10.	n - 2 = 8		20.	q + 15 = 25	

The operations, addition and subtraction, are inverse operations because doing one and then the other is the same as doing nothing at all.

Start with 10. Add 8. Subtract 8. What is the result? ________

Start with 59. Subtract 3. Add 3. What is the result? ________

Start with 6. Add 2. Divide by 2. What is the result? ________

Are addition and division inverse operations? ________

Can you guess what operation is the inverse of division? ________

Not all actions have inverses. Underline those of the following which do not:

1. Putting on your hat
2. Subtracting $\frac{3}{4}$
3. Smelling a flower
4. Looking at a picture
5. Turning on the lights
6. Multiplying by zero
7. What use do we make of the fact that addition is the inverse of subtraction? ________

a. 4612 - 3418 = ______ How do you check your result? ________

b. 8143 - 2752 = ______ How do you check your result? ________

NAME ______________________ DATE ______________ SCORE __________ NO. 108

MULTIPLICATION OF WHOLE NUMBERS

Multiplication of whole numbers requires memorization of the basic multiplication facts. In the following table fill in each blank with the product of the two numbers in the same horizontal row and the same vertical column.

x	0	1	2	3	4	5	6	7	8	9	10
0											
1											
2						10					
3										27	
4											
5							30				
6											
7											
8											
9											
10											

1. What do you notice about the product of any number and zero? ____________
2. What do you notice about the product of any number and one? ____________
3. What do you notice about the products in the "5" row? ____________
4. Are the answers in the 2 column the same as the answers in the 2 row? ____ In the 7 column and the 7 row? ______ Is there a row for every column which lists the same products? ____________
5. What do you notice about the products in the 10 row? ____________
6. Draw a straight line from the upper left hand corner of the multiplication table to the lower right hand corner. Look at both sides of the table. What do you notice about the two sides? ____________
7. What other patterns can you find? ____________
   Hints: (Look in the "2" column or the "3" column, or the "9" column)

NAME________________________ DATE______________ SCORE_________ NO. 109

DIVISION

X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X

1. Separate the 30 X's above into groups of 5 by drawing circles around each group of 5 X's. How many circles did you draw?__________________

$$\begin{array}{r} 30 \\ -5 \\ \hline 25 \\ -5 \\ \hline \end{array}$$

2. In the space at the left continue to subtract 5 from the remainders as long as you can. How many 5's did you subtract?________

3. Do your answers to numbers 1 and 2 agree? ______________

4. How many 5's equal 30?________________

5. 30 ÷ 5 = ______. This division asks, "How many groups of 5 each are in one group of 30?"

6. If you think 4 x 5 = 20 and subtract 20 from 30, how many 5's are you subtracting from 30 at one time?______Can more 5's be subtracted?_______If yes, how many more?__________

7. In the space at the right find how many 24's equal 120. To do this subtract 24 from 120 and then continue to subtract 24 from the remainders as many times as you can. How many 24's did you subtract?________________

$$\begin{array}{r} 120 \\ -24 \\ \hline \\ -24 \\ \hline \end{array}$$

8. Can you subtract four 24's from 120 at one time?________
How?____
Can you subtract another 24?____________________________

9. Can you subtract five 24's from 120 at one time?________

10. 120 ÷ 24 = ______________________

11. Can you subtract ten 25's from 325 at once?______________
325 - (10 x 25) = 350 - ______ = ______
Can more 25's be subtracted?_________How many more?________________

12. 325 ÷ 25 = __________ Do this division this way:

$$\left.\begin{array}{r} 325 \\ 10 \times 25 = \underline{\qquad} \\ \text{Subtract to get} = \underline{\qquad} \\ 3 \times 25 = \underline{\qquad} \\ \text{Subtract to get} = \underline{\qquad} \end{array}\right\} \quad 10 + 3 = \underline{\qquad\quad}$$

Using this method do the following division exercises:

13. 375 ÷ 15 14. 432 ÷ 12 15. 1472 ÷ 64

NAME________________________________DATE________________SCORE__________NO. 110

INVERSE OPERATIONS

Just as subtraction and addition are inverse operations, so are multiplication and division. Multiplication will undo division. Think of 16. Divide by 2. Multiply by 2. The result is ___________. Multiplying by 2 undid the ______________________by 2.

$$(16 \div 2) \times 2 = 16.$$

Is it also true that $(16 \times 2) \div 2 = 16$?____________

Apply this undoing idea to these mathematical sentences:

	DO	UNDO		DO	UNDO
1.	4 x 5 = 20	20 ÷ 5 = 4	9.	7 x 8 =	
2.	18 ÷ 3 = 6	6 x 3 =	10.	96 ÷ 24 =	
3.	1 x 15 =	15 ÷ 15 =	11.	874 ÷ 19 =	
4.	24 ÷ 6 =		12.	27 x 68 =	
5.	12 x 12 =		13.	1728 ÷ 12 =	
6.	338 ÷ 26 =		14.	59 x 83 =	
7.	5 x n = 30		15.	a ÷ 4 = 16	
8.	48 ÷ n = 8		16.	n x 6 = 42	

17. Multiply 23 x 36. Divide the product by 36. Is this answer the one you were supposed to get?_____

$$\begin{array}{r} 23 \\ \times\ 36 \\ \hline \end{array} \qquad 36\overline{)\qquad\qquad}$$

18. Divide 1488 by 31. Multiply the quotient by 31. Is this answer the one you were supposed to get? ____________

$$31\overline{)\,1488\qquad} \qquad \begin{array}{r} (\quad) \\ \times\ 31 \\ \hline \end{array}$$

Solve the following exercises and check by using the proper inverse operation.

19. 362 x 29
20. 1334 ÷ 18
21. 43 x 27
22. 98 x 42
23. 1872 ÷ 52
24. 450 ÷ 75

NAME______________ DATE__________ SCORE________ NO. 111

OPERATIONS AND MATHEMATICAL SENTENCES

An operation with numbers is a way of thinking about two numbers and getting one number. When we think of the numbers 7 and 5 and get 12, we are performing a mathematical operation. This operation we call addition. We have added two numbers and obtained one number called the "sum". When we think of 7 and 5 and get 2, we have performed another operation called subtraction. The number obtained in subtraction is called the "difference".

Complete this chart by writing the numeral or naming the operation.

Numbers Operated On	Result	Operation
3, 4	7	Addition
5, 3	2	Subtraction
10, 7	17	________
12,11	1	________
__, 7	63	Subtraction
13, 5	__	Addition

Numbers Operated On	Result	Operation
14, 4	__	Subtraction
9, __	2	Subtraction
15, __	24	Addition
Brainbuster:		
__, 9	14	________
__, 0	5	________

In English we write such sentences as "twelve plus five equals seventeen". In mathematics we write such sentences as "12 + 5 = 17." Operations are often written as mathematical sentences telling us that two numbers have been used with an operation to obtain one number. 16 - 9 = 7 is a mathematical sentence telling us that two numbers have been used with the subtraction operation to obtain one number.

Complete the following by writing the proper numeral on the line so that the mathematical sentences are true.

5 + 4 = ______

17 - 3 = ______

29 - 14 = ______

72 + 8 = ______

64 + ______ = 93

42 x ______ = 2562

76 - ______ = 57

______ + 92 = 141

29 - ______ = 19

23 - ______ = 23

93 + ______ = 93

128 ÷ 16 = ______

25 x 63 = ______

17 x ______ = 357

12 ÷ 3 = ______

806 ÷ ______ = 13

9 x ______ = 9

39 ÷ ______ = 13

NAME____________________ DATE____________ SCORE________ NO. 112

REVIEW OF WHOLE NUMBERS

1 8	2 5	▨	3		▨	4	
5		6	▨	▨	7		
▨	8		▨	▨	9		▨
10	▨	11				▨	12
▨	13		▨	▨	14	15	▨
16		▨	17	18	▨	19	20
	▨	21				▨	

WRITE ONLY A SINGLE DIGIT IN EACH WHITE SQUARE.

ACROSS

1. 100 - 15 (Answered for you)
3. 3,240 ÷ 36
4. 7 + 8 + 9 + 6 + 5 + 3
5. 2650 ÷ 25
7. 11820 ÷ 60
8. 8 x 7
9. 315 ÷ 9
11. 52 x 92
12. 12 - 4
13. 8 x 8
14. 14 x 7
16. 7 x 7
17. 121 ÷ 11
19. $\frac{1}{2}$ of 164
21. 16,029 ÷ 9

DOWN

1. 9 x 9
2. 884 - 379
4. 2765 ÷ 7
6. 3356 + 3288
7. 2408 - 1059
10. 63 ÷ 9
13. 780 - 711
15. 616 ÷ 7
16. 6 + 7 + 8 + 9 + 10
17. (2 x 4) + 9
18. Reverse the digits in the product 9 x 9
20. 100 - 80

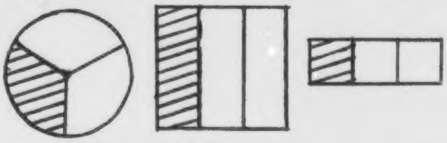
SHOW YOUR WORK HERE

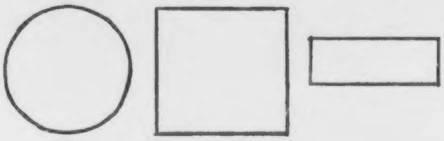
NAME ____________________ DATE __________ SCORE ________ NO. 113

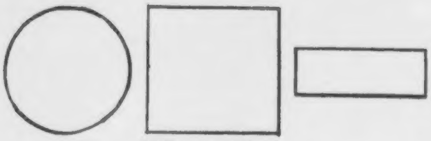
PICTURES OF FRACTIONS (PARTS OF A WHOLE)

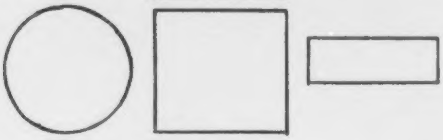
Shade each of the figures to show the fraction at the left

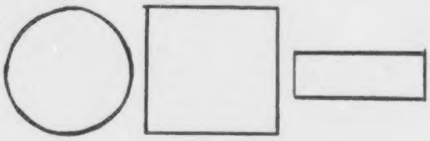
EXAMPLE:

$\frac{1}{3}$ 

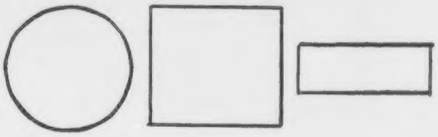
(1) $\frac{1}{2}$ 

(2) $\frac{1}{4}$ 

(3) $\frac{1}{8}$ 

(4) $\frac{2}{3}$ 

(5) $\frac{2}{2}$

(6) $\frac{3}{4}$ 

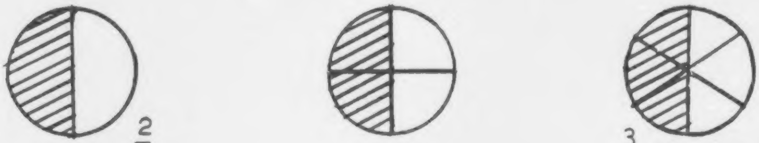
A. What does the denominator of a fraction tell us? ____________________

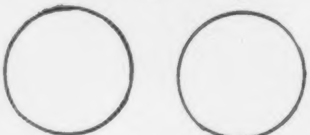
B. What does the numerator of a fraction mean? ____________________

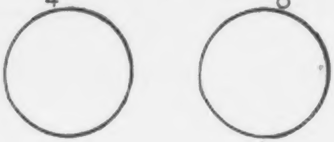
C. Explain why this statement is not always correct: If a whole figure is divided into 3 parts, each part is $\frac{1}{3}$ of the figure. ____________________

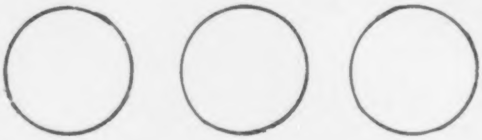
Show by shading diagrams that different fractions name the same number.

EXAMPLE: $\frac{1}{2} = \frac{2}{4} = \frac{3}{6}$

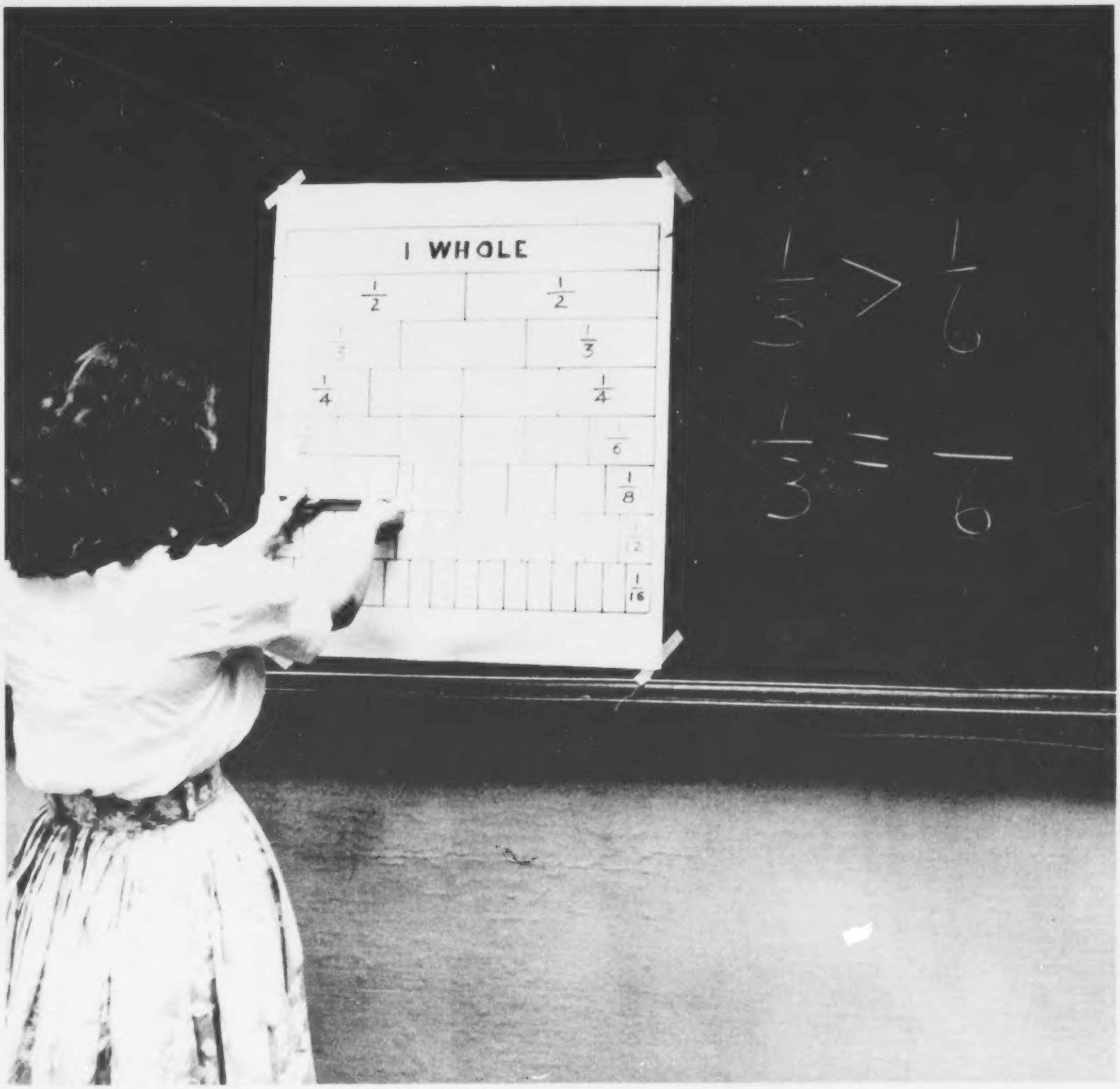


(1) $\frac{1}{4} = \frac{2}{8}$ 

(2) $\frac{3}{4} = \frac{6}{8}$ 

(3) $\frac{2}{2} = \frac{3}{3} = \frac{4}{4}$ 

(4) $\frac{2}{3} = \frac{4}{6}$


1 WHOLE
1/2
1/2
1/3
1/3
1/4
1/4
1/6
1/8
1/12
1/16
1/3 > 1/6
1/3 = /6

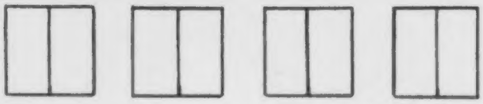
A PUPIL DISCOVERS DIFFERENT NUMERALS FOR THE SAME NUMBER

NAME ______________________ DATE ____________ SCORE ________ NO. 114

COMMON FRACTIONS

I. Writing improper fractions as whole or mixed numbers:

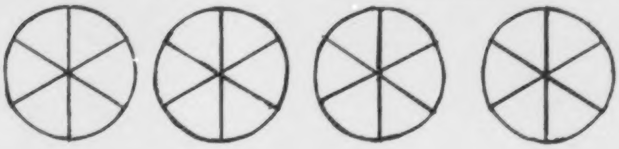
(1)



Shade $\frac{6}{2}$

$\frac{6}{2}$ = ________

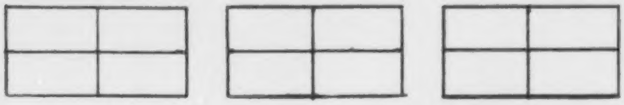
(2)



Shade $\frac{11}{6}$

$\frac{11}{6}$ = ________

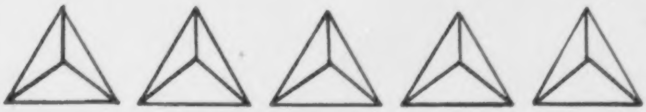
(3)



Shade $\frac{7}{4}$

$\frac{7}{4}$ = ________

(4)



Shade $\frac{11}{3}$

$\frac{11}{3}$ = ________

II. Adding fractions with the same denominator.

Shade the parts that illustrate the fraction opposite each figure and add.

If the answer is an improper fraction, change it to a whole or mixed number.

(1)

$\frac{1}{2}$

$\frac{1}{2}$

$\frac{1}{2}$

____

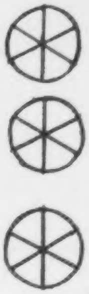
(2)

$\frac{3}{4}$

$\frac{2}{4}$

____

(3)



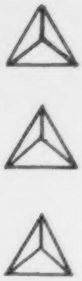
$\frac{2}{6}$

$\frac{4}{6}$

$\frac{1}{6}$

____

(4)



$\frac{1}{3}$

$\frac{2}{3}$

$\frac{1}{3}$

____

(5) $\frac{2}{3} + \frac{2}{3}$ = ____

(6) $\frac{4}{5} + \frac{3}{5}$ = ____

(7) $\frac{5}{8} + \frac{4}{8}$ = ____

(8) $\frac{3}{10} + \frac{7}{10}$ = ____

(9) $\frac{5}{6} + \frac{2}{6}$ = ____

(10) Henry's mother has an apple pie and wants to divide it equally among 5 boys. Into how many equal parts will she have to cut the pie? ______ Each piece will be what fraction of the pie? ______

NAME______________________________ DATE_______________ SCORE_________ NO. 115

WRITING FRACTIONS IN SIMPLEST FORM

A. Find the following products.

1. $3 \times 2 =$ ______
2. $5 \times 7 =$ ______
3. $4 \times 3 =$ ______
4. $12 \times 3 =$ ______
5. $4 \times 9 =$ ______
6. $15 \times 18 =$ ______

Pairs of numbers like these at the left are called factors of their products.

B. Find pairs of factors for the following numbers.

7. $15 = \underline{3 \times 5}$
8. $21 =$ ______
9. $35 =$ ______
10. $6 =$ ______
11. $39 =$ ______
12. $34 =$ ______
13. $55 =$ ______
14. $12 =$ ______
15. $72 =$ ______

C. 16. Do the numbers 15 and 21 have a common factor?____________________

17. Do the numbers 15 and 35 have a common factor?____________________

18. Do the numbers 15 and 6 have a common factor?____________________

D. A fraction whose numerator and denominator has a common factor other than 1 is not in simplest form. $\frac{6}{15}$, $\frac{15}{21}$, and $\frac{15}{35}$ are not in simplest form. Circle the fractions that are not in simplest form in Ex. 19-24.

19. $\frac{3}{12}$ 20. $\frac{9}{16}$ 21. $\frac{4}{8}$ 22. $\frac{15}{20}$ 23. $\frac{5}{9}$ 24. $\frac{17}{27}$

E. Write $\frac{6}{15}$ in simplest form.

Factor both terms of $\frac{6}{15} = \frac{3 \times 2}{3 \times 5}$

$= \frac{3}{3} \times \frac{2}{5}$

$= 1 \times \frac{2}{5}$

$= \frac{2}{5}$

25. Write $\frac{15}{21}$ in simplest form.

$\frac{15}{21} = \frac{\_\_ \times 5}{\_\_ \times 7}$

$= \frac{\_\_}{\_\_} \times \frac{5}{7}$

$= \_\_ \times \frac{5}{7}$

$=$ ______

F. Write the following fractions in simplest form.

26. $\frac{15}{35}$
27. $\frac{4}{12}$
28. $\frac{12}{18}$
29. $\frac{9}{15}$
30. $\frac{20}{25}$
31. $\frac{12}{16}$
32. $\frac{8}{48}$
33. $\frac{10}{8}$
34. $\frac{26}{39}$
35. $\frac{42}{56}$
36. $\frac{13}{13}$
37. $\frac{243}{576}$

NAME ______________________ DATE ______________ SCORE __________ NO. 116

DIFFERENT NUMERALS FOR THE SAME NUMBER

A. Find the following products.

1. 5×1 ______
2. 19×1 ______
3. 28×1 ______
4. 1×528 ______
5. 632×1 ______
6. 498×1 ______
7. $4\frac{1}{2} \times 1$ ______
8. $N \times 1$ ______
9. 678941×1 ____

What is the product when any number is multiplied by 1? ____________

B. Underline the numerals below which are names for the number 1.

10. (a) $\frac{3}{3}$ (b) $\frac{9}{8}$ (c) $\frac{0}{1}$ (d) $\frac{25}{24}$ (e) $\frac{2\frac{1}{2}}{2\frac{1}{2}}$

C. 11. (a) What is the product of $\frac{3}{4}$ and 1? __________

(b) $\frac{3}{4} \times \frac{5}{5} = \frac{15}{20}$ Are $\frac{15}{20}$ and $\frac{3}{4}$ names for the same number? __________

12. (a) What is the product of $\frac{5}{8}$ and 1? __________

(b) $\frac{5}{8} \times \frac{3}{3} =$ _____ Are $\frac{15}{24}$ and $\frac{5}{8}$ names for the same number? __________

D. An easy method of finding another name for a number written as a fraction is to multiply it by 1 in a convenient form.

13. What form of 1 is used to change the fraction $\frac{5}{6}$ to a fraction with 12 as the denominator? ______

14. What form of 1 is used to change $\frac{9}{10}$ to a fraction with 100 as the denominator? ________

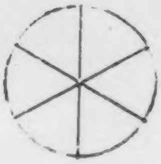
15. What form of 1 is used to change the fraction $\frac{5}{6}$ to a fraction with 15 as the numerator? ________

E. Fill in the blanks below. What can you say about the given fraction and the fraction you complete? ________________________

16. $\frac{2}{3}$, $\frac{2}{3} \times \frac{4}{4} = \frac{\quad}{12}$
17. $\frac{3}{8}$, $\frac{3}{8} \times \frac{2}{2} = \frac{6}{\quad}$
18. $\frac{9}{10}$, $= \frac{\quad}{50}$
19. $\frac{1}{4}$, $= \frac{5}{\quad}$
20. $\frac{3}{7}$, $= \frac{\quad}{21}$
21. $\frac{5}{9}$, $= \frac{20}{\quad}$
22. $\frac{3}{4}$, $= \frac{\quad}{10}$
23. $\frac{5}{12}$, $= \frac{\quad}{100}$

NAME________________________________ DATE________________ SCORE__________ NO. 117

MULTIPLICATION OF A WHOLE NUMBER AND A FRACTION

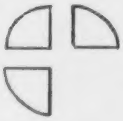


1. This pie is divided into 6 equal parts. The whole pie is how many sixths?__________ Write in numerals what the picture tells you ________________________ = 1.

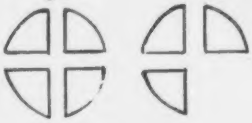
2. What does $\frac{4}{4}$ equal?__________________ What does $\frac{8}{8}$ equal?________________

3. Complete the following $\frac{\quad}{3} = 1$; $\frac{5}{\quad} = 1$; $\frac{\quad}{21} = 1$.

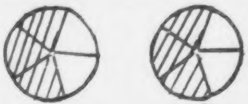
4. Each of the figures at the right represents one fourth of a pie.
3 times 1 fourth = __________ fourths.
$3 \times \frac{1}{4} = \frac{\quad}{4}$,



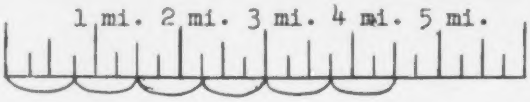
5. Each of the figures at the right represents one fourth of a pie.
7 times one fourth = ________ fourths.
$7 \times \frac{1}{4} = \frac{\quad}{4}$



6. $\frac{3}{5}$'s of each pie below is shaded. $2 \times \frac{3}{5} = \frac{\quad}{5}$



7. Jack rode his bicycle $\frac{3}{4}$ of a mile to school each way. How far did he ride in 3 days on his way to and from school?_________ By what do you multiply



$\frac{3}{4}$ to get the answer?_______. The problem then becomes: _____ $\times \frac{3}{4}$ = ______.
How many whole miles equal this many fourths?_________ How many fourths are left over?__________ fourths. What is the simplest answer you can give to express the number of miles Jack rode?________________

8. In exercises 5, 6, and 7 you may have thought of another way to write the answer. Fractions likes $\frac{8}{3}$ or $\frac{13}{4}$ may be written as mixed numbers $\frac{8}{3} = \frac{6}{3} + \frac{\quad}{3}$ or $2 + \frac{\quad}{3}$ or $2\frac{\quad}{3}$. $\frac{13}{4}$ = ____ + $\frac{1}{4}$ or ________ or ________
Write your answers to exercises 5, 6, and 7 as mixed numbers. 5 _________,
6 __________, 7 __________.

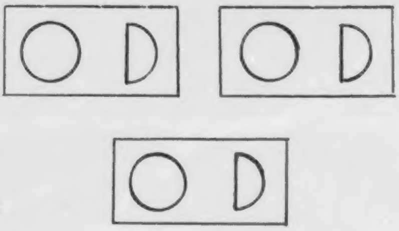
9. Find the following products and write your answer in simplest form.

a. $3 \times \frac{1}{5}$ b. $4 \times \frac{1}{2}$ c. $2 \times \frac{3}{4}$ d. $12 \times \frac{1}{4}$

NAME______________________________ DATE_______________ SCORE__________ NO. 118

MULTIPLICATION OF A WHOLE AND A MIXED NUMBER

In each of the three boxes at the right there are $1\frac{1}{2}$ circles. In all there are 3 complete circles and 3 half circles. How can you find how many circles there are altogether?_________



If you multiply perhaps your work will look like this:

$3 \times 1\frac{1}{2}$

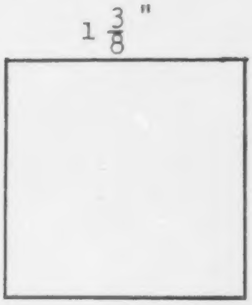
$3 \times (1 + \frac{1}{2})$

$3 \times 1 + 3 \times \frac{1}{2}$

$3 + 1\frac{1}{2}$ or $4\frac{1}{2}$

There are __________circles.

One side of a square is $1\frac{3}{8}$ inches.



Find the distance around the square. Since there are 4 equal sides, the distance around the square is $4 \times 1\frac{3}{8}$

$4 \times (1 + \frac{3}{8})$

$4 \times 1 + 4 \times \frac{3}{8}$

$4 + \frac{12}{8}$

$4 + \frac{3}{2}$

$4 + 1\frac{1}{2}$ or $5\frac{1}{2}$

The distance around the square is ________inches

Student Council had a popcorn sale. The profit on each bag of popcorn was $2\frac{3}{4}$ cents. How much profit did the Council make on each 5 bags sold?

$5 \times (2\frac{3}{4})$

$5 \times 2 + 5 \times \frac{3}{4}$

$10 + \frac{15}{4}$

$10 + 3\frac{3}{4}$

$13\frac{3}{4}$

The profit from selling the popcorn was _____________cents on 5 bags.

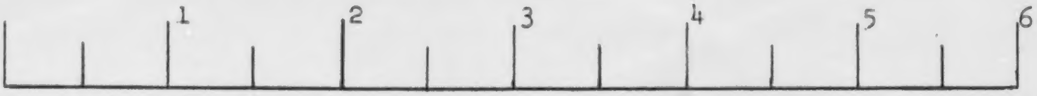
FIND THE FOLLOWING PRODUCTS:

1. $6 \times 1\frac{3}{4}$ 2. $2\frac{5}{9} \times 7$ 3. $5 \times 4\frac{1}{5}$ 4. $9 \times 6\frac{2}{3}$ 5. $8 \times 7\frac{3}{8}$

NAME ______________________ DATE ____________ SCORE ________ NO. 119

DIVIDING BY FRACTIONS

1. When we divide 6 by $\frac{1}{2}$ we find how many $\frac{1}{2}$'s equal 6. The rule below is



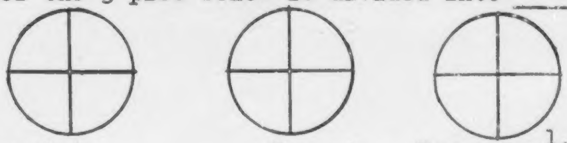
marked in $\frac{1}{2}$-inch units. How many $\frac{1}{2}$-inch units equal 6 inches?________

Think of the problem this way. How many $\frac{1}{2}$-inches equal 1 inch?________

How many 1 inches equal 6 inches?________ For each 1 inch there are how

many $\frac{1}{2}$-inches? ________Then 6 inches equal ____________ $\frac{1}{2}$-inches.

2. Each of the 3 pies below is divided into ___________ equal parts.



Each part is __________of a pie. How many $\frac{1}{4}$'s equal each pie?__________

How many $\frac{1}{4}$'s equal the three pies? __________ Shade $\frac{3}{4}$ of each pie. What

part of each pie is not shaded? _________ How many of these are there?

________ What part of a pie do these make together? __________ How many

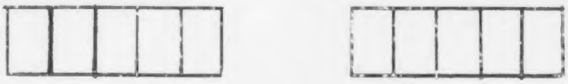
$\frac{3}{4}$'s equal 3? __________ In symbols $3 \div \frac{3}{4} =$ ______. $3 \times \frac{4}{3} =$ ________.

If you divide 3 by $\frac{3}{4}$ do you get the same answer you do if you multiply

3 by $\frac{4}{3}$? __________

3. Into how many equal parts is each of the two rectangular areas divided?

____



$2 \div \frac{1}{5} =$ ________ What is 2×5? ______ Does dividing 2 by $\frac{1}{5}$ give the

same answer as multiplying 2×5? ________ How many groups of $\frac{2}{5}$ are in

the two areas? ________ $2 \div \frac{2}{5} =$ _______. What is $2 \times \frac{5}{2}$? _________

Does dividing 2 by $\frac{2}{5}$ give the same answer as multiplying 2 by $\frac{5}{2}$? ________

Do you see: Division by any number is the same as multiplication by the reciprocal of the number.

Try these: $12 \div \frac{2}{3}$, $10 \div \frac{2}{5}$, $4 \div \frac{2}{3}$, $16 \div \frac{8}{9}$

NAME______________________________ DATE______________ SCORE_________ NO. 120

RECIPROCALS

Find the following products:

$6 \times \frac{1}{6} =$ ______ $8 \times \frac{1}{8} =$ ______ $2 \times \frac{1}{2} =$ ______ $3 \times \frac{1}{3} =$ ______

$\frac{1}{5} \times 5 =$ ______ $\frac{1}{4} \times 4 =$ ______ $\frac{1}{10} \times 10 =$ ______ $\frac{1}{15} \times 15 =$ ______

Pairs of numbers like these which have 1 as their product are called reciprocals. Each one of a pair is the reciprocal of the other. What is the reciprocal of 7? ________ What is the reciprocal of $\frac{1}{9}$? __________

Write the reciprocals of the following:

12 ______ $\frac{1}{20}$ ______ 18 ______ $\frac{1}{100}$ ______ 50 ______

Find the following products:

$\frac{2}{3} \times \frac{3}{2} =$ ______ $\frac{3}{4} \times \frac{4}{3} =$ ______ $\frac{5}{2} \times \frac{2}{5} =$ ______ $\frac{100}{3} \times \frac{3}{100} =$ ______

Are the above pairs of numbers pairs of reciprocals? ________________

Write the reciprocals of the following:

$\frac{3}{8}$ ______ $\frac{5}{9}$ ______ $\frac{12}{5}$ ______ $2\frac{1}{2}$ ______

$3\frac{1}{4}$ ______ $1\frac{2}{3}$ ______ $6\frac{1}{2}$ ______ $\frac{16}{25}$ ______

Do the following problems:

$12 \div 6 =$ ______ $12 \times \frac{1}{6} =$ ______

$18 \div 3 =$ ______ $18 \times \frac{1}{3} =$ ______

$10 \div 4 =$ ______ $10 \times \frac{1}{4} =$ ______

$12 \div 5 =$ ______ $12 \times \frac{1}{5} =$ ______

$75 \div 3 =$ ______ $75 \times \frac{1}{3} =$ ______

$144 \div 12 =$ ______ $144 \times \frac{1}{12} =$ ______

$3 \div 1\frac{1}{2} =$ ______ $3 \times \frac{2}{3} =$ ______

Does multiplying by the reciprocal of a number give the same answer as dividing by the number? ________________

NAME ______________________________ DATE ______________ SCORE __________ NO. 121

EVERYDAY USES OF COMMON FRACTIONS

Find the cost of 5 pounds of candy if one pound costs 60 cents. __________

What operation did you use? ________________________

Find the cost of $3\frac{1}{2}$ pounds of candy if one pound costs 60 cents. ________

What operation did you use? ________________________

Find the cost of $\frac{3}{4}$ pound of candy if one pound costs 60 cents. __________

What operation did you use? ________________________

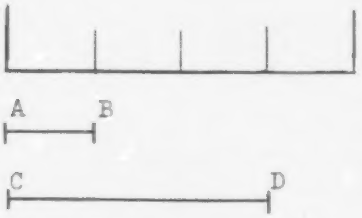
Do the kinds of numbers used change the operation? ______________ Is multiplication the necessary operation whether the number of pounds is a whole number, mixed number, or fraction? ________________________

To find the cost of $\frac{3}{4}$ pound of candy, if one pound costs 60 cents, you multiply $\frac{3}{4} \times 60$. This becomes $\frac{3}{4} \times \frac{60}{1}$ or $\frac{3 \times 60}{4 \times 1}$ or $\frac{3 \times 4 \times 15}{4 \times 1}$ or $\frac{3 \times 15}{1} = 45$. The cost of the $\frac{3}{4}$ pound of candy is __________ cents.

1. Find the cost of $\frac{3}{4}$ pound of sausage at 80 cents a pound. __________
2. What is the cost of $\frac{1}{3}$ dozen rolls if they cost 48 cents per dozen? ________
3. If one dozen eggs costs 56 cents, what is the cost of $\frac{1}{2}$ dozen? __________
4. At a certain store fractional parts of a cent are totaled at the end of the bill. In this store soap is sold at $12\frac{1}{2}$ cents per bar. What will the customer pay if he purchases only one bar? ________ two bars? ________ three bars? ________
5. Suppose a person wanted to buy $\frac{1}{4}$ pound of butter selling at 66 cents per pound. What is the actual cost of the $\frac{1}{4}$ pound of butter? __________ How much will the person pay for the $\frac{1}{4}$ pound? ________
6. Find the cost of two bars of soap on sale at 3 bars for 29 cents. How many bars of soap are in the unit sold for 29 cents? ________ What fractional part of this unit is being bought? ________ The problem then becomes __________ of 29 cents. How much must be paid for the two bars if the store charges one whole cent for any part of a cent on the total bill? ____________
7. A Home Economics teacher is buying cloth so that each of 32 girls will have $\frac{3}{4}$ yard of material in order to complete a sewing project. How much material must she buy? __________
8. $\frac{3}{8} \times 24$ 9. $\frac{5}{9} \times 20$ 10. $36 \times \frac{1}{6}$ 11. $48 \times \frac{2}{5}$

NAME ________________________ DATE ____________ SCORE ________ NO. 122

SUBTRACTION OF FRACTIONS



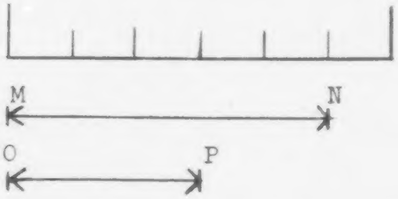
1. Into how many equal parts is the line segment at the left divided? ____________

2. AB is what part of the line segment? ______

3. CD is what part of the line segment? ______

4. What part of the line segment is this? __________

5. $\frac{3}{4} - \frac{1}{4} =$ ______. What is another name for this fraction? ________



6. Into how many equal parts is the line segment at the left divided? ________

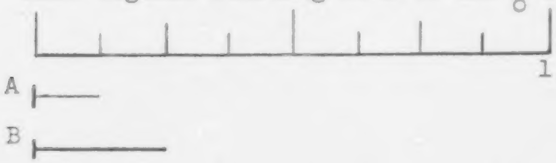
7. What part of the line segment above is MN? __________

8. What part of the line segment above is OP? __________

9. How many parts longer than OP is MN? ________ What part of the line segment is this? ______________

10. $\frac{5}{6} - \frac{3}{6} =$ ______ What is another name for this fraction? __________

11. The 1 inch section of the ruler shown below has been enlarged. What fractional part of an inch is each division? ______ Extend the line segment below the ruler starting at A to the $\frac{1}{2}$ inch mark. Extend the line segment starting at B to the $\frac{7}{8}$ inch mark.



12. How much longer is the line segment starting at B than the one starting at A? ____________

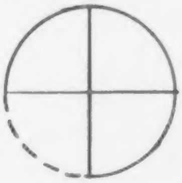
13. $\frac{7}{8} - \frac{1}{2} =$ ________

14. What does one do to the fraction $\frac{1}{2}$ to do this subtraction problem? ______________ The problem then becomes $\frac{7}{8} - \frac{\quad}{8} =$ ________

NAME______________________________ DATE_______________ SCORE_________ NO. 123

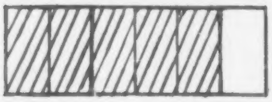
SUBTRACTION OF FRACTIONS

Fractions which have the same denominator may easily be subtracted.



1. What part of a disk is shown in the figure at the left? __________ Shade $\frac{1}{4}$ of the complete disk. What part remains unshaded?___________

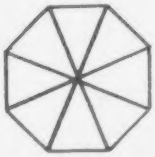
2. $\frac{3}{4} - \frac{1}{4} =$ _________



3. What part of the figure at the left is shaded with lines in this direction ////? __________

4. Shade the 3 equal parts on the left end of the figure with lines in this direction \\\\\\\\ . What part of the figure remains shaded with lines in this direction ////? __________

5. $\frac{5}{6} - \frac{3}{6} =$ ________



6. Into how many equal parts is the area at the left divided? _________What fractional part of the area is each of these parts? _____________

7. Shade 7 of these parts with //// lines. What part of the area is shaded? _____________

8. Shade three of the already shaded parts with \\\\\\\\ lines. What part of the area is shaded twice? ___________ What part is shaded once?_______ What part is not shaded? ____________

9. $\frac{7}{8} - \frac{3}{8} =$ _______, $\frac{8}{8} - \frac{7}{8} =$ _______, $\frac{8}{8} - \frac{3}{8} =$ _______ $\frac{8}{8} - \frac{5}{8} =$ _______

Subtract and express your answers in simplest form.

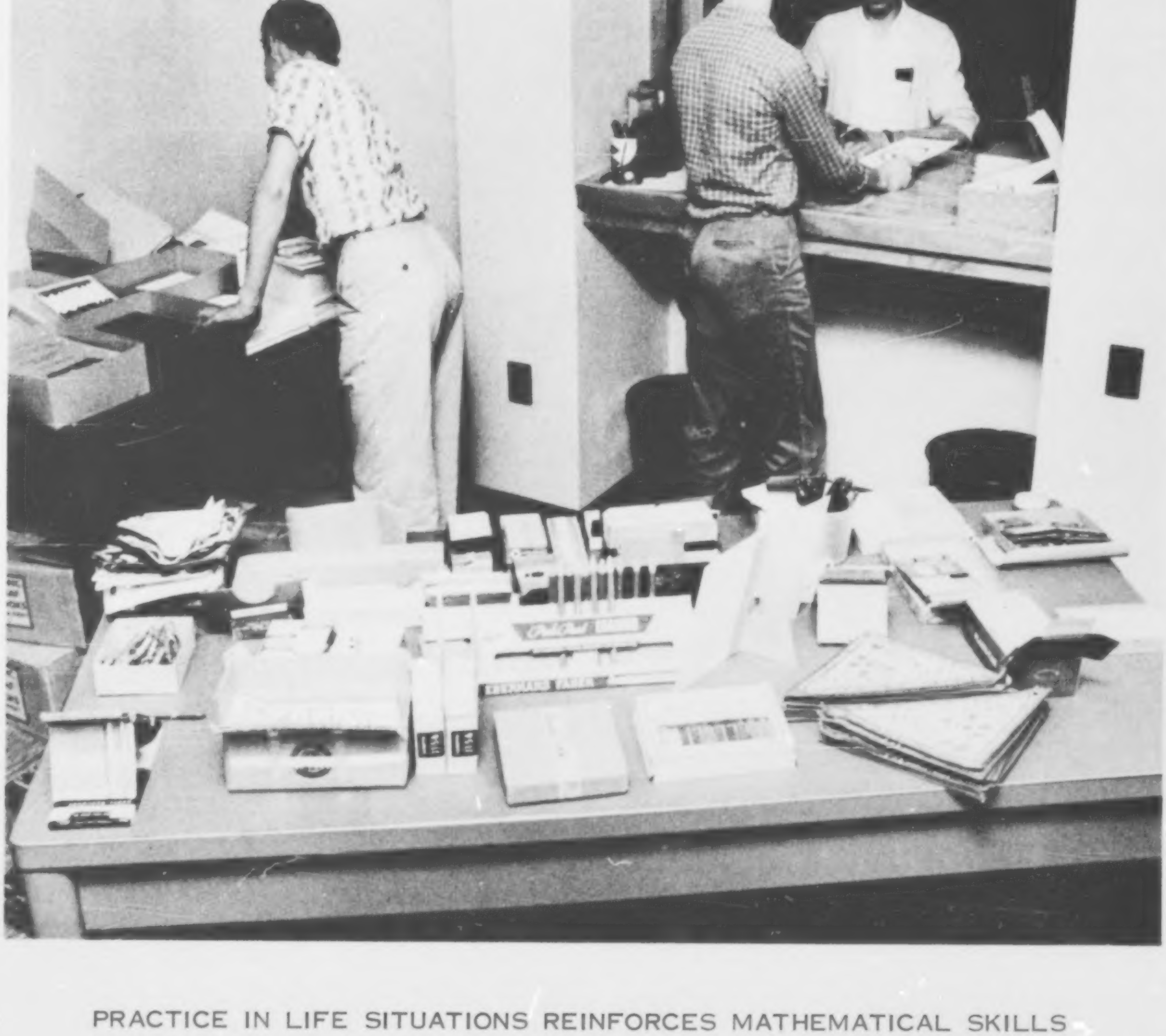
10. $\begin{array}{r} \frac{7}{8} \\ \frac{4}{8} \\ \hline \end{array}$

11. $\begin{array}{r} \frac{8}{12} \\ \frac{3}{12} \\ \hline \end{array}$

12. $\begin{array}{r} \frac{11}{16} \\ \frac{3}{16} \\ \hline \end{array}$

13. $\begin{array}{r} 12\frac{6}{9} \\ 10\frac{4}{9} \\ \hline \end{array}$

14. $\begin{array}{r} \frac{7}{8} \\ \frac{1}{2} \\ \hline \end{array}$



PRACTICE IN LIFE SITUATIONS REINFORCES MATHEMATICAL SKILLS

NAME________________________ DATE______________ SCORE__________ NO. 124

MAKING CHANGE

In making change, the clerk seldom subtracts. He really adds. First he repeats the cost of the article. Then he adds the value of each coin to this cost as he hands the coins to the customer. The clerk stops when he reaches the amount of money handed to him in the first place. The clerk tries to make change with as few coins as possible.

For example: Judy buys a $.10 notebook at the school store. She gives the clerk a one-dollar bill. How much change should she receive? __________ As the clerk puts the change into Judy's hand, he says, "Ten cents for the notebook, fifteen cents, twenty-five cents, fifty cents, one dollar." Fill in the column at the right:

Notebook	$.10	coins Judy receives
He says	.15	one nickel
	.25	
	.50	
	1.00	

Fill in the blanks below:

Cost of Article	Money given to Clerk	Amounts named by clerk in making change	Change
33¢	50¢	34¢, 35¢, 40¢, 50¢	2 pennies, 1 nickel, 1 dime
7¢	25¢		
14¢	25¢		
23¢	50¢		
56¢	75¢		
63¢	75¢		
81¢	1.00		

You are given $10 by your mother along with the following list and sent to the grocery store. How much will the groceries cost? Are there any taxes? How much change will you receive?

2 dozen eggs at $.52 a dozen __________ Tax, if any __________

5 lbs. potatoes at $.09 a lb. __________ Total __________

1 box soap at $.79 __________ Change __________

NAME____________________ DATE__________ SCORE________ NO. 125

DECIMAL FRACTIONS AND MONEY

U.S. money is based on dollars and cents. It is a decimal system. One cent may be written in several ways: 1 cent = 1¢ = $.01. One dollar is written: $1.00 or $1 .

It is necessary to know how to write an amount of money in words and in numerals. Name one place where both ways are used.

Write the following using a decimal point and a dollar sign:

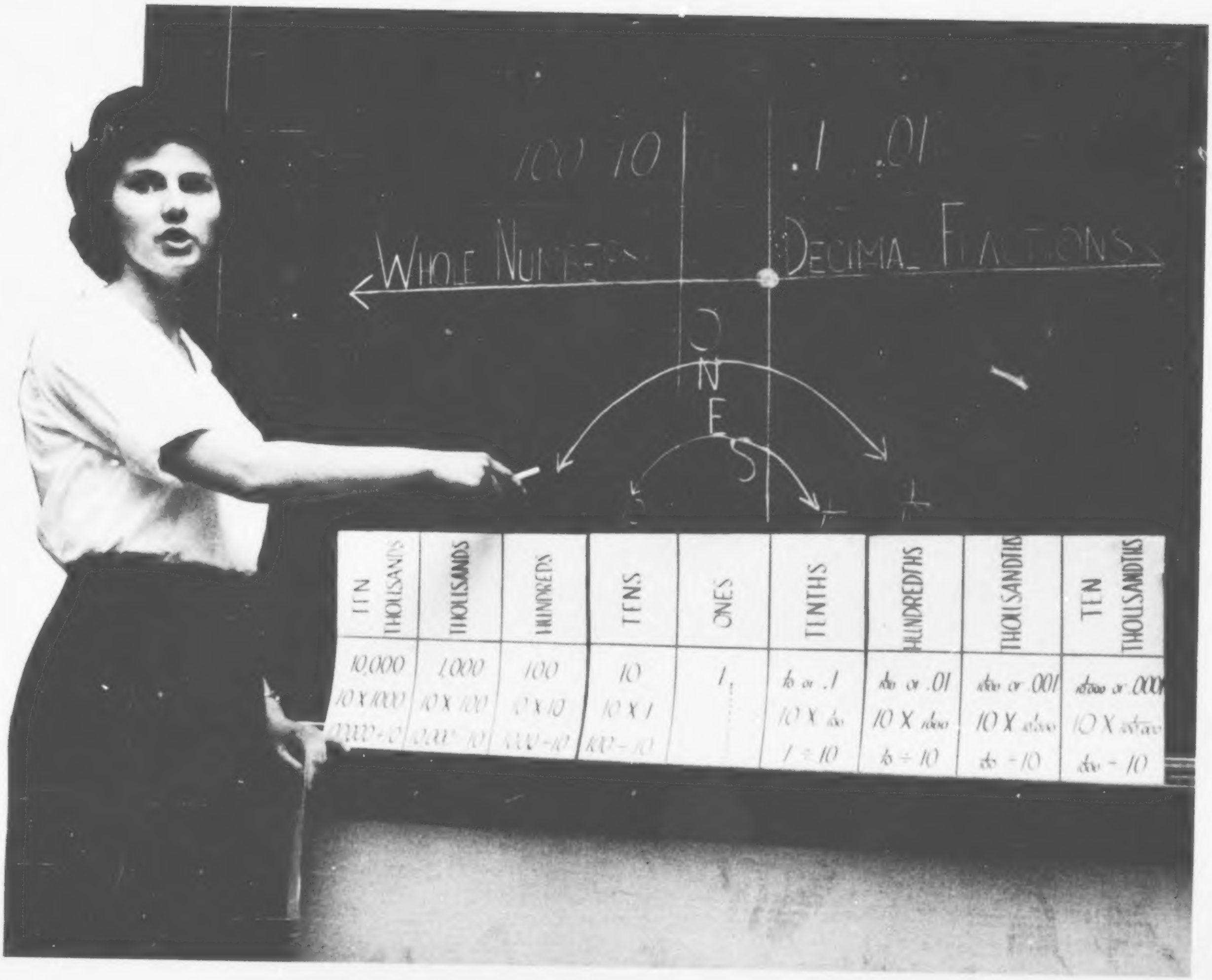
(1) 10¢ = __________
(2) 69¢ = __________
(3) 128¢ = __________
(4) half a dollar = __________
(5) six dimes = __________
(6) one quarter = __________
(7) ten cents = __________
(8) twenty-one cents = __________
(9) seventy-five cents = __________
(10) one dollar and thirty-five cents = __________
(11) fifty dollars and one cent = __________
(12) forty-six dollars and fifteen cents = __________
(13) one hundred four dollars and ten cents = __________
(14) a dollar and a half = __________
(15) a dollar sixty-nine = __________
(16) two thousand five hundred dollars = __________

Write the following in words:

(17) $.08 ______________________________
(18) 29¢ ______________________________
(19) $3.45 ______________________________
(20) $10.27 ______________________________
(21) $1.98 ______________________________
(22) $93.56 ______________________________
(23) $451.75 ______________________________

In $2.19, the 2 stands for 2 whole dollars; the 1 stands for 1 dime or 1 tenth of a dollar; the 9 stands for 9 cents or 9 hundredths of a dollar.

(24) In $4.37, the 4 stands for ____________________
, the 3 stands for ____________________
, the 7 stands for ____________________


100 10
.1 .01
WHOLE NUMBERS
DECIMAL FRACTIONS
ONES
TEN THOUSANDS
THOUSANDS
HUNDREDS
TENS
ONES
TENTHS
HUNDREDTHS
THOUSANDTHS
TEN THOUSANDTHS
10,000
1,000
100
10
1
10 X 1000
10 X 100
10 X 10
10 X 1
10,000 ÷ 10
1000 ÷ 10
100 ÷ 10

CHART, CHALKBOARD, AND TEACHER MAKE A GOOD TEAM

NAME ______________________ DATE ____________ SCORE ________ NO. 126

DECIMAL FRACTIONS

In decimal fractions we do not write the denominator as we do in common fractions. We write the numerator only. We let the idea of place value tell us what the denominator is. Complete the following statements by filling in the blanks.

In 485.236

1. The 4 means 4 x ________ because it is in the ____________ place.
2. The 8 means 8 x ________ because it is in the ____________ place.
3. The 5 means 5 x ________ because it is in the ____________ place.

10x10x10 thousands	10x10 hundreds	10 tens	1 ones	$\frac{1}{10}$ tenths	$\frac{1}{10x10}$ hundredths	$\frac{1}{10x10x10}$ thousandths
	4	8	5	2	3	6

4. The 2 means 2 x ________ because it is in the ____________ place.
5. The 3 means 3 x ________ because it is in the ____________ place.
6. The 6 means 6 x ________ because it is in the ____________ place.

7. What is the value of the first place on the right of the ones place?_____
8. What is the value of the second place on the right of the ones place?____
9. What part of the value of a place is the value of the next place to its right? ______________
10. What is the name of the denominator in each fraction below?
    (a) .3 ________ (b) .26 ________ (c) .329 ________
    (d) .04 ________ (e) .004 ________ (f) .444 ________
11. Write the following as a common fraction with a denominator of 10, 100, or 1000.
    (a) .6 ______ (b) .12 ______ (c) .29 ______ (d) .375 ______
    (e) 3.6 ______ (f) .012 ______ (g) .2 ______ (h) .73 ______
12. Write the following in decimal form.
    (a) $\frac{1}{10}$ ______ (b) $\frac{3}{100}$ ______ (c) $4\frac{2}{10}$ ______ (d) $6\frac{81}{100}$ ______

13.

	NUMBER	DECIMAL FRACTION	COMMON FRACTION
(a)	nine tenths	.9	$\frac{9}{10}$
(b)	nine hundredths		
(c)	one and six tenths		
(d)	ten and ten thousandths		
(e)	four and ten hundredths		
(f)	seven hundredths		
(g)	six and forty-six hundredths		
(h)	two and three tenths		
(i)	six and seven hundredths		
(j)	one thousandth		

NAME________________________ DATE____________ SCORE________ NO. 127

RATIO

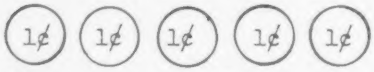
1. Mary is 5 ft. tall. John is 6 ft. tall. To compare the number of feet in their heights complete the following sentence.

   Mary's height is ____________________________ John's.

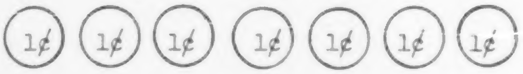
2. If you said Mary's height is 1 ft. less than John's did you add? ______ subtract? ______ multiply? ______ divide? ______

3. If you said Mary's height is $\frac{5}{6}$ of John's, did you add? _______ subtract? ______ multiply? ______ divide? ______

4. When numbers are compared by division, the answer is called the ratio (rā′ shĭ ō). The ratio of 5 to 6 is $\frac{5}{6}$.



are Joe's coins



are Bill's coins

What is the ratio of the number of Joe's coins to the number of Bill's coins? ____________________________

5. What is the ratio of 5 inches to 12 inches? __________________

6. What is the ratio of 8 boys to 15 boys? __________________

7. What is the ratio of 27 inches to 36 inches? __________________

8. Team A won 24 games. Team B won 19 games. What is the ratio of the number of games won by Team A to the number of games won by Team B?

   ____

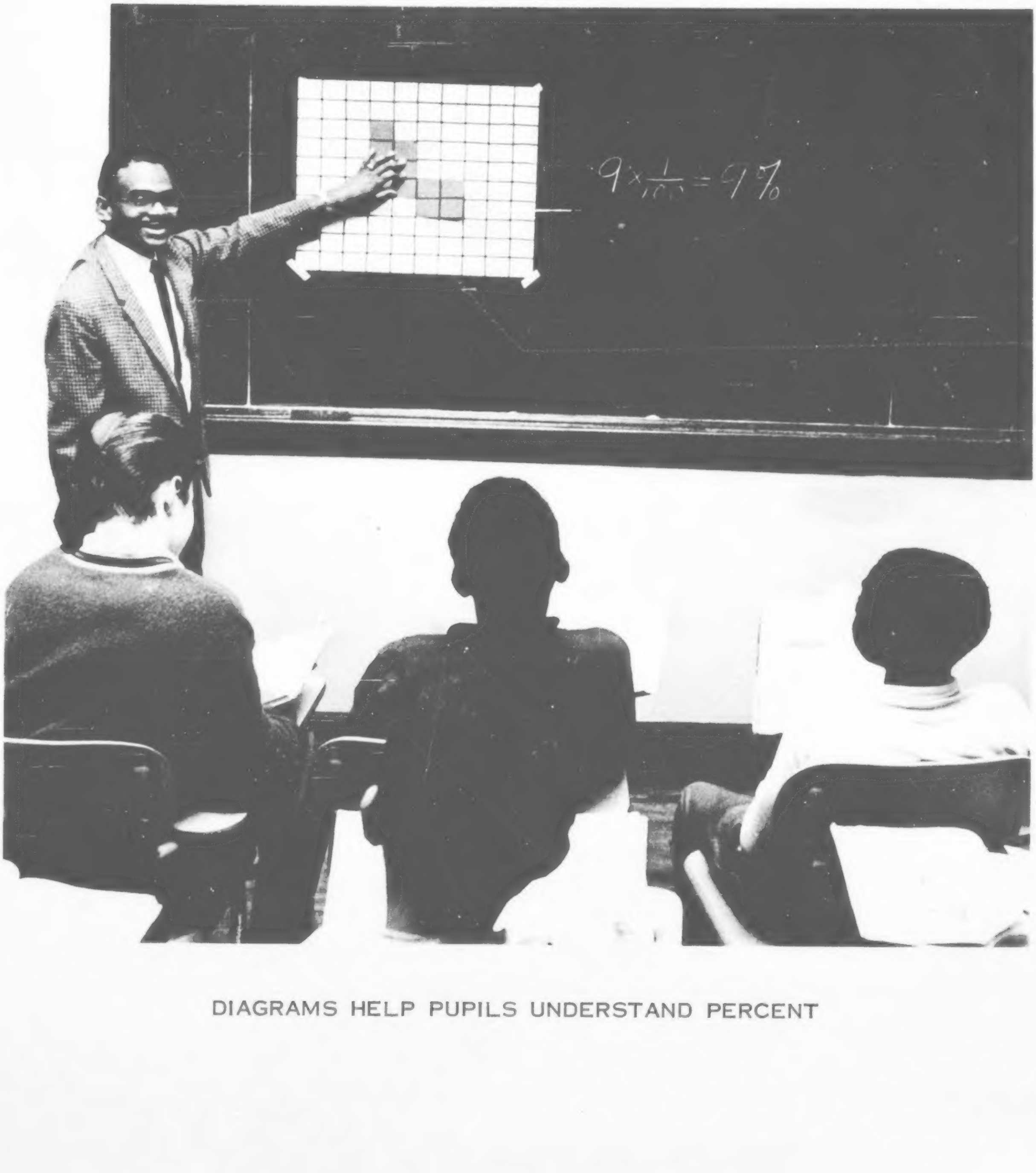
9. Mary weighs about 70 lbs. Her brother weighs about 100 lbs. What is the ratio of the number of pounds Mary weighs to the number of pounds her brother weighs? ____________________________

CIRCLE THE FRACTIONS WHICH NAME THE SAME RATIO.

10. $\frac{9}{12}$ $\frac{75}{100}$ $\frac{1}{3}$ $\frac{30}{40}$ $\frac{3}{5}$ $\frac{3}{4}$

11. $\frac{40}{100}$ $\frac{1}{6}$ $\frac{10}{25}$ $\frac{2}{5}$ $\frac{8}{20}$ $\frac{250}{1000}$

12. $\frac{12}{8}$ $\frac{100}{66\frac{2}{3}}$ $\frac{7}{5}$ $\frac{3}{2}$ $\frac{75}{50}$ $\frac{12}{9}$

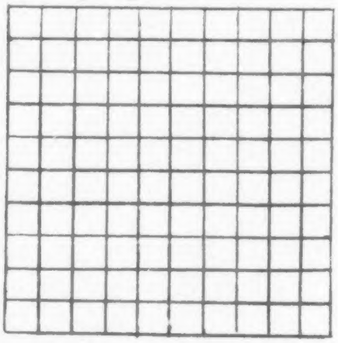


DIAGRAMS HELP PUPILS UNDERSTAND PERCENT

NAME ____________________ DATE ____________ SCORE ________ NO. 128

INTRODUCTION TO PERCENT

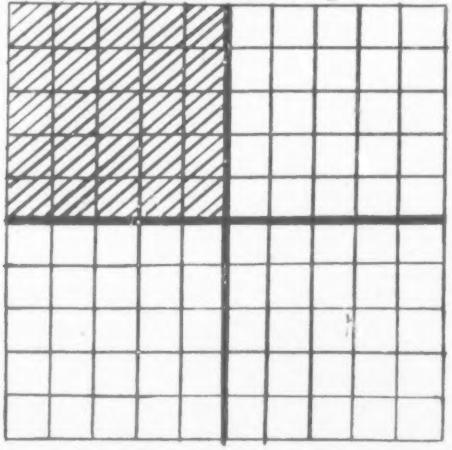
1. How many squares are in the figure below? ________ Each small square is what fractional part of the large square? ________ What is the ratio of each small square to all of the small squares? ________ Another name for this fraction or ratio ($\frac{1}{100}$) is 1% (1 percent).



2. Shade 50 of the small squares. Write the ratio of the shaded squares to all of the small squares. ________

3. Do $\frac{50}{100}$ and $\frac{1}{2}$ name the same ratio? ________

4. Write this ratio as a percent. ________



5. What part of the large square at the left is shaded? ________

   $\frac{1}{4} = \frac{\square}{100}$ $\frac{1}{4}$ = ______%

6. What part of the large square is not shaded? ______

   $\frac{3}{4} = \frac{\square}{100}$ $\frac{3}{4}$ = ______%

   (Fill in the boxes in Problems 5 and 6)

7. What is the sum of the number of squares shaded and the number not shaded? ________

8. All of the small squares is what percent of the large square? ________

9. If fabric is marked 59% dacron and the rest is cotton, what percent is cotton? ________

10. Is it possible to have percents greater than 100%? ________ Explain.

____

NAME ______________________ DATE ______________ SCORE __________ NO. 129

CHANGING NUMERALS FROM PERCENT FORM TO FRACTION FORM

There are many different numerals for the same number. On each line below circle the numerals which name the same number.

1.	14	12 + 2	$\frac{28}{2}$	7 x 2	.7
2.	$\frac{1}{2}$	$\frac{50}{100}$	$\frac{5}{9}$	.2	.5
3.	1	$\frac{100}{100}$	$\frac{9}{8}$	$\frac{0}{1}$	1.00
4.	$\frac{3}{4}$	$\frac{12}{15}$	$\frac{75}{100}$	7.5	0.75

Numerals may also be written with the percent sign, %. Examples are 4%, 50%, and 120%. An easy way to think of the % sign is to think of it as meaning "multiply by one-hundredth".

5. (a) Write one one-hundredth as a common fraction. ______ As a decimal fraction ____________

(b) You may write 6% as a decimal fraction, 6 x .01, or __________.

(c) You may write 6% as a common fraction, 6 x $\frac{1}{100}$, or _____ or _____.

Write the names of the following in the forms indicated. (Write common fractions in the simplest form.)

	Percent Form	Decimal Fraction Form	Common Fraction Form
6.	20%	__________	__________
7.	30%	__________	__________
8.	$33\frac{1}{3}$%	__________	__________
9.	50%	__________	__________
10.	90%	__________	__________
11.	$66\frac{2}{3}$%	__________	__________
12.	80%	__________	__________
13.	10%	__________	__________
14.	5%	__________	__________
15.	4%	__________	__________
16.	2%	__________	__________
17.	150%	__________	__________
18.	200%	__________	__________

NAME ______________________ DATE ____________ SCORE ________ NO. 130

PERCENTS AND FRACTIONS MAY BE USED TO NAME THE SAME RATIO

1. Multiply $\frac{1}{2}$ by 1 using the name $\frac{50}{50}$ for 1. ______

   $\frac{50}{100}$ = ________% Is $\frac{1}{2}$ = 50%? ______

2. Multiply $\frac{3}{4}$ by 1 using name $\frac{25}{25}$ for 1. ______

   $\frac{75}{100}$ = ________% Is $\frac{3}{4}$ = 75%? ______

3. Multiply $\frac{2}{5}$ by 1 using the name $\frac{20}{20}$ for 1. ______

   $\frac{40}{100}$ = ________% Is $\frac{2}{5}$ = 40%? ______

4. Multiply $\frac{3}{8}$ by 1 using the name $\frac{12\frac{1}{2}}{12\frac{1}{2}}$ for 1. ______

   $\frac{37\frac{1}{2}}{100}$ = ______% Is $\frac{3}{8}$ = $37\frac{1}{2}$% ? ______

Change the following fractions to hundredths and percents as indicated:

5. $\frac{1}{10} = \frac{10}{100}$ = ________%
6. $\frac{1}{5} = \frac{\quad}{100}$ = ________%
7. $\frac{3}{5}$ = ____ = ________%
8. $\frac{6}{10}$ = ___ = ________%
9. $\frac{7}{10}$ = ___ = ________%
10. $\frac{4}{5}$ = ____ = ________%
11. $\frac{9}{10}$ = ___ = ________%
12. $\frac{1}{20}$ = ___ = ________%
13. $\frac{3}{20}$ = ___ = ________%
14. $\frac{7}{20}$ = ___ = ________%
15. $\frac{4}{5}$ = ____ = ________%
16. $\frac{1}{4}$ = ____ = ________%
17. $\frac{1}{6}$ = ____ = ________%
18. $\frac{1}{25}$ = ___ = ________%
19. $\frac{3}{25}$ = ______ = ________%
20. $\frac{13}{25}$ = ______ = ________%
21. $\frac{21}{25}$ = ______ = ________%
22. $\frac{1}{3}$ = ______ = ________%
23. $\frac{2}{3}$ = ______ = ________%
24. $\frac{7}{8}$ = ______ = ________%
25. $\frac{1}{40}$ = ______ = ________%
26. $\frac{9}{40}$ = ______ = ________%
27. $\frac{9}{30}$ = ______ = ________%
28. $\frac{5}{6}$ = ______ = ________%
29. $\frac{3}{10}$ = ______ = ________%
30. $\frac{5}{8}$ = ______ = ________%
31. $\frac{10}{10}$ = ______ = ________%

32. Store A advertised skates $\frac{1}{3}$ off and Store B advertised the same skates 30% off. If the original price of the skates was the same in both stores, which store offered the best bargain? ____________________

NAME________________________________ DATE________________ SCORE__________ NO. 131

FINDING A PERCENT OF A NUMBER

A ratio may be expressed in three ways in our way of writing numerals. The ratio of 25 to 100 may be expressed as:

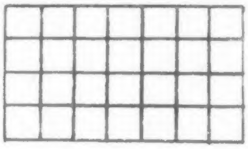
A. ______________ percent form B. ____________________ common fraction form C. ____________________ decimal fraction form

Many percent problems ask us to find a percent of a number, as the following examples show.

1. The Federal luxury tax is 10%. How much tax is charged for a $25 watch?
2. An employer pays 6% social security tax for a gardener. The gardener earned $125. How much tax was paid for him?
3. A savings and loan company paid 4% interest on deposits. How much interest was paid on savings of $562?

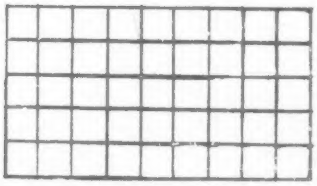
In each case, it is necessary to find a percent or fraction of a number. What operation is needed to find a fraction of a number as $\frac{3}{4}$ of 36? ________

To find 25% of 28 you think 25% is $\frac{25}{100}$ or .25 and then find .25 of 28. Could you also use the form $\frac{25}{100}$ of 28? __________



In the diagram at the left, there are four rows of seven blocks each. Shade the diagram to show that your answer is correct.

4. 25% of 28
   .25 x 28 = ______ or $\frac{1}{4}$ x 28 = ________



In the diagram at the left, there are 45 divisions. Find 60% of 45 using numerals and by shading the diagram.

5. 60% of 45 = ________

6. Solve problem 1 above ____________

7. Solve problem 2 above __________ 8. Solve problem 3 above __________

9. 72% of 65 = ________ 10. 5% of 48 = _______ 11. 75% of 63 = _______

Now you know how to find a percent of a number. You find the product of the number and the percent expressed in decimal or common fraction form.

Example: 36% of 72 → .36 x 72 = ________

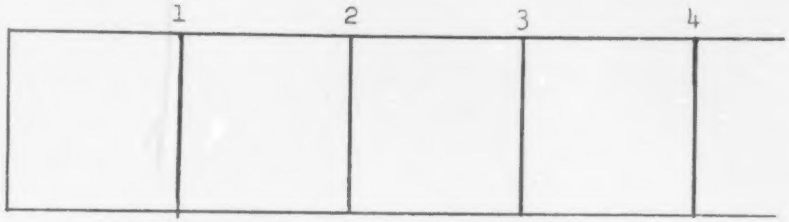
Find the following:

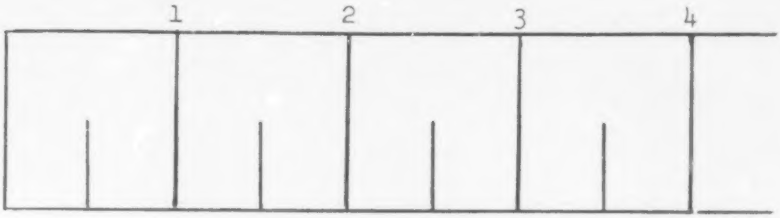
12. 93% of 24 = _______ 13. 55% of 114 = ______ 14. 7% of 66.66 = _____

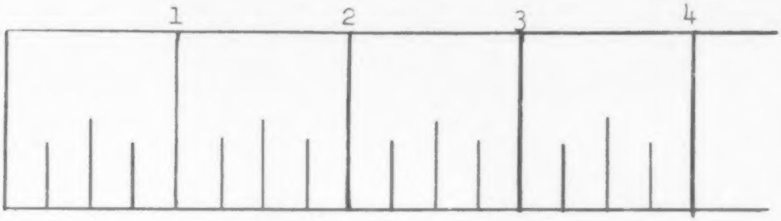
15. 50% of 390 = ______ 16. 80% of $21.06 = ___ 17. 13% of 13 = ______

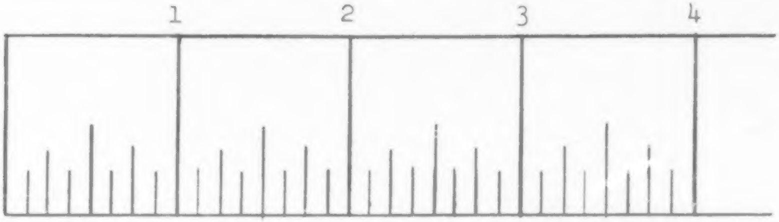
To Be Used with 132

Mark on each rule what part of an inch is indicated by the smallest space in each example below:









CUT OUT THE RULERS OR FOLD THIS PAPER AND USE THE RULERS TO

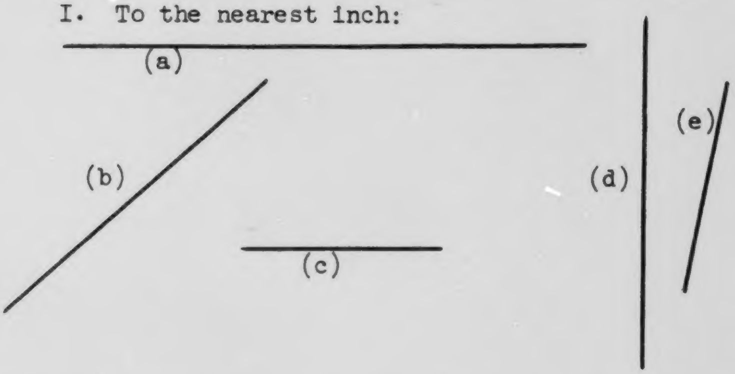
MEASURE THE LENGTHS OF THE LINES ON THE NEXT PAGE

NAME________________________________ DATE_______________ SCORE__________ NO. 132

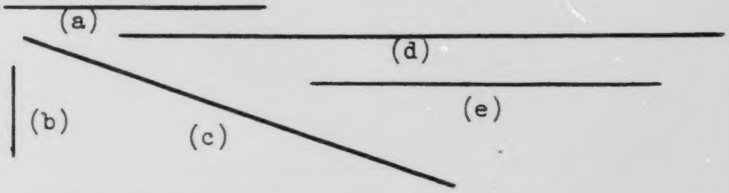
USING A RULER

Directions: First estimate, then measure and record both answers at the right. Use the rulers on the attached page.

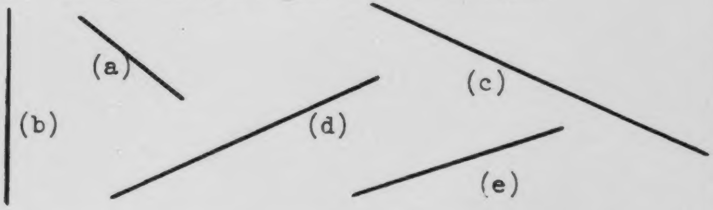
I. To the nearest inch:



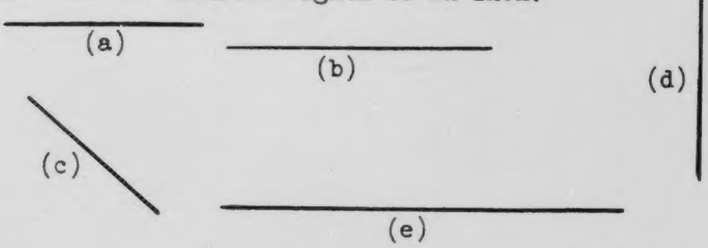
II. To the nearest half inch:



III. To the nearest quarter of an inch:



IV. To the nearest eighth of an inch:



	Estimate	Measure
a		
b		
c		
d		
e		
a		
b		
c		
d		
e		
a		
b		
c		
d		
e		
a		
b		
c		
d		
e		

The smaller the spaces between markings on the ruler that you use, the more precise the measurement is. Which group of line segments has been measured most precisely? ____________________________

NAME______________________________ DATE________________ SCORE__________ NO. 133

BUYING FOOD

12 units = 1 dozen
2 pints = 1 quart
16 ounces = 1 pound

If one orange costs 5 cents:

1. How much will 6 oranges cost? __________
2. How much will 12 oranges cost? __________ a dozen oranges cost? ________
3. How much will $\frac{1}{2}$ dozen oranges cost? ________
4. How much will 1 $\frac{1}{2}$ dozen oranges cost? ___________

If one dozen lemons cost $.48, find the cost of these quantities:

5. 1 lemon __________; 3 lemons __________; 4 lemons __________
6. At the same price for lemons, what will John pay for $\frac{1}{2}$ dozen? ________
7. Complete the following by writing the proper numeral in the blank:

1 dozen = _______ lemons
$\frac{1}{2}$ dozen = _______ lemons
$\frac{1}{4}$ dozen = _______ lemons
$\frac{1}{12}$ dozen = _______ lemons
$\frac{1}{6}$ dozen = _______ lemons
$\frac{1}{3}$ dozen = _______ lemons

6 lemons = _______ dozen
12 lemons = _______ dozen
3 lemons = _______ dozen
2 lemons = _______ dozen
4 lemons = _______ dozen
1 lemon = _______ dozen

8. If eggs cost $.54 a dozen, what will $\frac{1}{2}$ dozen cost? ___________
9. When butter is $.73 a pound, what will a quarter of a pound cost? _______
10. If flour is 10 pounds for 90 cents, what will 2 cups cost? ____________
(2 cups = 1 pound)
11. When sugar is 10 cents a pound, what will 1 cup cost? ___________
(2 cups = 1 pound)
12. There are 4 cups in a quart of milk. When milk is 24 cents a quart, what is the price of 1 cup? _________ $\frac{1}{2}$ cup? _________
13. The grocery gives a premium stamp for each 10 cents of the total bill. If the bill is $8.70, how many stamps should the customer receive? _____________
14. The cost of frozen lemonade is 27¢ for a 12 oz. can or 90¢ for six 6 oz. cans. Which is less expensive? _______ What is the difference in cost per ounce between the two prices? _____________

100.

NAME ______________________ DATE ____________ SCORE ________ NO. 134

TIME

A decade is ten. A score is twenty. A century is a hundred.

The Table of Time

60 seconds (sec.) = 1 minute (min.)
60 minutes (min.) = 1 hour (hr.)
24 hours (hr.) = 1 day (da.)
7 days (da.) = 1 week (wk.)
30 days = 1 month (mo.)
12 months = 1 year (yr.)
52 weeks, 365 days, or 12 months (mo.) = 1 year
366 days (da.) = 1 leap year
10 years = 1 decade
100 years = 1 century

1 min. = ______ sec.
1 da. = ______ hr.
1 leap yr. = ______ da.
7 wk. = ______ da.
1 decade = ______ yr.
1 yr. = ______ mo.

1 hr. = ______ min.
1 wk. = ______ da.
1 yr. = ______ da.
6 hr. = ______ min.
1 century = ______ yr.
1 mo. = ______ da.

WORK SPACE

1. Mr. White earns $1.25 an hour. He works 8 hours a day, 5 days a week. How much does he earn in 1 day? ______ In one week? ____

2. Fred earns $245 a month. He works 12 months in a year. How much does he earn in a year? ______________

3. George travels in his car at the rate of 45 miles an hour. How many miles will he travel in 6 hours? __________ How far will he travel in one minute? ________

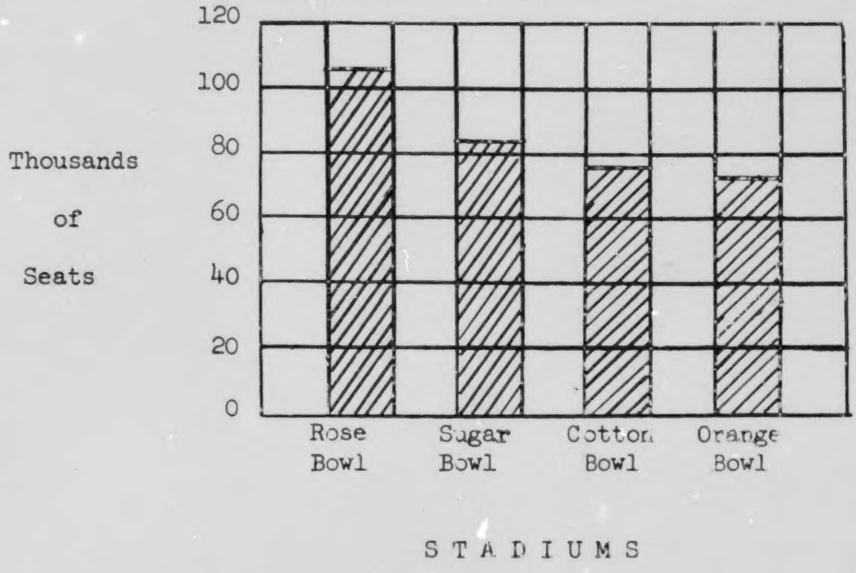
4. Write 30, 60, 90, days as fractions of a business year (360 days). ______________

____

5. June 12, 1962 can be written in a shorter form as 6/12/62. Write today's date in the short way. ____________________

NAME________________________ DATE____________ SCORE________ NO. 135

SEATING CAPACITY OF FOUR FOOTBALL STADIUMS



Source:
Almanac

1. What does this bar graph show? ____________________
   What is the source of information? ____________________
2. What is meant by 40 on the vertical scale? ____________________
   What is the value of each of the equal spaces on the vertical scale?
   ____
3. What do you notice about the size of each space on the vertical scale?
   ____
   What is the starting point of the vertical scale? ________________
4. Which bar shows the greatest seating capacity? ________________
5. How do the bars for the Cotton Bowl and Orange Bowl compare? ________
6. In what order are the stadiums listed? ____________________
7. What do you notice about the distance between the bars? __________
8. In table form the information above looks like this:

Stadium	Seating Capacity	Round to the nearest thousand
Rose Bowl	100,188	________________
Sugar Bowl	82,985	________________
Cotton Bowl	75,504	________________
Orange Bowl	68,718	________________

Does the table or the graph tell you the information more quickly and easily? __________ Which gives more complete information? ____________

NAME ______________________ DATE ______________ SCORE __________ NO. 136

THE SPACE AGE

Today we are living in an age of space travel. We need to know how to compute with large numbers, for speeds are high and distances are great.

1. Round the diameter of each planet to the nearest thousand:

Planet	Diameter	Rounded to thousands
a) Mars	4140 miles	
b) Earth	7920 miles	
c) Mercury	3010 miles	
d) Jupiter	86,900 miles	

2. The diameter of the earth is about how many times that of Mars? ______________________

3. Venus comes closer to earth than any other large planet. Venus is only about 24 million miles from earth. Express this distance using numerals. ______________________

4. In a recent airplane race the winning airplane in one class traveled 507.255 miles per hour. The winner in another class traveled 460.423 miles per hour. How much faster did the one airplane fly than the other? ______________________

5. The astronaut, Scott Carpenter, traveled 81,850 miles in space in 3 trips around the earth. What is the average length of one trip or orbit which he traveled? ______________________

6. A commercial airplane flying from Los Angeles to Chicago flew 196.6 miles the first hour, 203.7 miles the second hour, 193.8 miles the third hour, and 211.3 miles the fourth hour. How far did the plane fly in four hours? ______________________

7. A giant super jet, carrying 100 passengers, can fly from California to New York, about 2700 miles, in $4\frac{1}{2}$ hours. How far does the jet fly in 1 hour? ______________________

8. This jet uses fuel at the rate of 200 gallons per hour. At this rate how many gallons of gas will be needed for the trip? __________

STUDY GUIDES SUGGESTED

FOR

EIGHTH GRADE

LESSON PLAN TO ACCOMPANY 201

ODD AND EVEN NUMBERS

Objectives

To help pupils recognize the set of even numbers, the set of odd numbers, and the relationships between the two sets.

To stimulate thought about other properties of numbers.

Readiness Activities

Review multiples of 2.

Review positional values of whole numbers in the decimal system with emphasis on the ones place.

Review related vocabulary

Remainder
Digit
Factor
Horizontal
Vertical
Sum

Concepts Which The Teacher May Wish To Develop With The Pupils

If a number is divided by 2, the remainder is either 0 or 1.

An even number has as a factor the number 2.

In our decimal system of numeration, a numeral with 0, 2, 4, 6, or 8 in the ones position represents an even number. In other numeration systems, the numeral of an even number does not necessarily end in these digits.

"A multiple of 2," "an even number," "a number divisible by 2," "product of 2 and a whole number," all have the same meaning.

There is one-to-one correspondence between even and odd numbers.

The sum of an even number and an even number is even.

The sum of an odd number and an even number is odd.

The sum of an odd number and an odd number is even.

A whole number belongs either to the set of odd numbers or to the set of even numbers.

Concepts (continued)

The difference of an even number and one is an odd number.

The difference of an odd number and one is an even number.

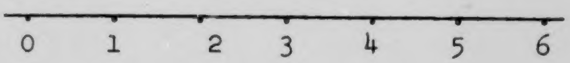
The difference of an even number and an even number is even.

The difference of an odd number and an odd number is even.

The difference of an even number and an odd number is odd.

Suggested Classroom Activities

Show on a number line the relative positions of odd and even numbers.



Place large numerals on flash cards. Have a contest between groups of pupils to determine which numbers are odd and which are even.

List the first thirty counting numbers. Cross out all the even numbers. What kinds of numbers are left? How often do even numbers occur? Have the pupils count by 2's up to 50 beginning with zero.

Determine whether a number is a multiple of 2 by testing only the digit in the ones place. Any digit in the tens, hundreds, or thousands place will be a multiple of 2 since all powers of 10 from 10^1 --- 10^N $(N \neq 0)$ are multiples of 2. This is why #3 in the study guide works. Not all pupils will be able to understand this.

Problems for Class Discussion

1. How can you describe the following sets of numbers? $\{7, 3, 5, 17, 101\}$, $\{8, 102, 100\}$

2. Which of the following sums is odd? (Try to answer this without adding.)

$99 + 77 =$ $\qquad$ $198 + 362 =$

$8199 + 1228 =$ $\qquad$ $5 + 7 + 1 =$

3. Is $\frac{48}{156}$ in simplest terms? How do you know?

   Is $\frac{41}{162}$ in simplest terms? How do you know?

   Is $\frac{102840}{102484}$ in simplest terms? How do you know?

Problems (continued)

4. Write down all the possible combinations of three of the digits, 1, 2, 3 4, 5, 6, 7, 8, 9 which will total 15 (In preparation for problem 10).

1 + 5 + 9 = 15
1 + 6 + 8 = 15
2 + 4 + 9 = 15
2 + 5 + 8 = 15
2 + 6 + 7 = 15
3 + 4 + 8 = 15
3 + 5 + 7 = 15
4 + 5 + 6 = 15

Which digit appears most frequently in the addends? (five)

One solution for problem 10

8	1	6
3	5	7
4	9	2

5. If 16 is an even number, how do you find the next higher odd number? The next lower odd number?

If 16 is an even number, how do you find the next higher even number? The next lower even number?

6. Find the other factor.

16 = 2 x ______   1086 = 2 x ______   98 = 2 x ______

Use of the Study Guide in Directed Study

Suggested Techniques for Evaluation

Discuss questions related to even and odd numbers.

1. What is an even number? (A number which has 2 as a factor.)
2. If a number is not even, what is it called? (odd)
3. How can we use even numbers in our mathematics? (We can find the factors of a product. We can simplify common fractions.)

Use a teacher-made quiz to determine extent of learning.

Collect the study guide for later marking.

NAME ______________________ DATE ______________ SCORE __________ NO. 201

ODD AND EVEN NUMBERS (Addition)

1. Count from 2 to 20 by 2's: 2 4 ___ ___ ___ ___ ___ ___ ___ 20
   These are all even numbers. Do any of these numbers have a remainder when divided by 2? ______________________

2. Count from 1 to 19 by 2's: 1 3 ___ ___ ___ ___ ___ ___ ___ 19
   These are all odd numbers. Do any of these numbers have a remainder when divided by 2? ______________________

3. What is a quick way to tell whether a number is even? ______________________
   ____

4. All even house numbers are found on the same side of the street. Put a circle around each of the even house numbers listed below.

   25 37 64 31,766 50 36,763 2568

   102 56 101 20,681 738 49 4683

5. Add the following and then state whether the sum is even or odd.

   7 + 1 = 8 even 11 + 1 = ___ ______ 123 + 1 = ___ ______

   9 + 1 = ___ ______ 13 + 1 = ___ ______ 199 + 1 = ___ ______

   When 1 is added to an odd number, is the sum odd or even? ____________

6. Add the following and then state whether the sum is even or odd.

   4 + 1 = ___ odd 12 + 1 = ___ ______ 324 + 1 = ___ ______

   8 + 1 = ___ ______ 30 + 1 = ___ ______ 1198 + 1 = ___ ______

   When 1 is added to an even number, is the sum odd or even? ____________

7. Find the sum of the following pairs of numbers.

   4 + 2 = ______ 36 + 4 = ______ 98 + 42 = ______

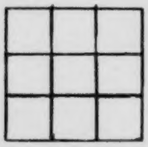
   4 + 5 = ______ 19 + 11 = ______ 99 + 31 = ______

   4 + 7 = ______ 19 + 12 = ______ 108 + 13 = ______

8. The sum of two even numbers is ______________(odd, even)

9. The sum of two odd numbers is ______________(odd, even)

10. The sum of an even and an odd number is ______________(odd, even)

11. 

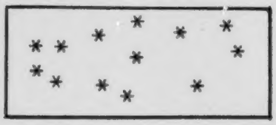
    Fill in each block with one of the numerals 1, 2, 3, 4, 5, 6, 7, 8, and 9 so that the sum of the digits is always 15 whether you add horizontally or vertically. Use information about odd and even numbers to avoid guessing.

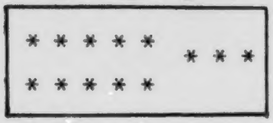
NAME____________________________ DATE______________ SCORE_________ NO. 202

SYSTEMS OF NUMERATION

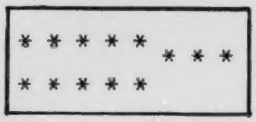
When does 31 not mean thirty-one?

Let's look at this set of stars. Can you group them by tens? In our base ten system we say there are 13 stars, or 1 group of ten and 3 groups of ones. How else can they be grouped? Can you group them by fives?





13
Base ten

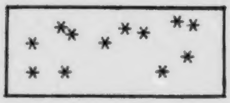


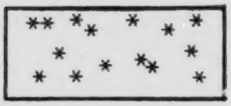
23
Base five

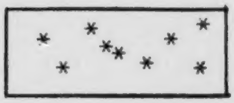
If we group by fives, we have 2 groups of five each and 3 left. For this we write "23_{five}" and we say that the numeral, "23_{five}" (read: two three base five) is written in base five.

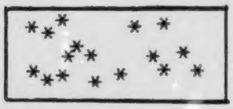
Prepare sixteen small paper squares. Place them on your desk. Can you group them by fives? What numeral represents the number of squares in the arrangement? ________________________
Base five

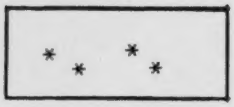
Group the following sets of stars as shown below into the groups named and write the numeral which represents the number of stars in the box.

1.

________ Base ten
________ Base five

2.

________ Base ten
________ Base five

3.

________ Base ten
________ Base five

4.

________ Base ten
________ Base six

5.

________ Base ten
________ Base eight

NAME ______________________ DATE ______________ SCORE ________ NO. 203

ORDER IN ADDITION

A good way to check an addition problem is to add in the other direction. (If you add a column from top to bottom, check it by adding from bottom to top.) Try it below.

$$\begin{array}{r}13\\ \underline{21}\end{array} \qquad\qquad \begin{array}{r}21\\ \underline{13}\end{array}$$

You also know that if we put 8 books with 5 books, we get the same number of books as putting 5 books with 8 books. 8 added to 5 is the same as 5 added to 8.

You will notice that the order in which we add 2 numbers makes no difference. The sum will be the same.

$9 + 4 =$ ______ $\qquad 4 + 9 =$ ______

We can write $4 + 9 = 9 + 4$. "9 + 4" and "4 + 9" are both names for the same number, 13.

Tell whether these number sentences are true or false. Write each total if the statement is true.

(1) $16 + 8 = 8 + 16$ T 24

(2) $21 + 32 = 32 + 21$ ___ ___

(3) $124 + 47 = 17 + 124$ ___ ___

(4) $.07 + .22 = .22 + .07$ ___ ___

(5) $.38 + 1.61 = 1.61 + .38$ ___ ___

(6) $\frac{1}{2} + \frac{1}{4} = \frac{1}{4} + \frac{1}{2}$ ___ ___

(7) $68 + 50 = 50 + 86$ ___ ___

(8) $5.0 + 5.4 = 5.4 + .5$ ___ ___

(9) $4\frac{1}{4} + 7\frac{1}{2} = 7\frac{1}{2} + 4\frac{1}{4}$ ___ ___

(10) $39 + 57 = 57 + 93$ ___ ___

Check the following addition problems by reversing the addends, and show that the sum is the same:

(11) $\begin{array}{r}124\\ \underline{+672}\end{array} \quad \begin{array}{r}672\\ \underline{+124}\end{array}$ $\qquad$ (12) $\begin{array}{r}\$3.89\\ \underline{+1.21}\end{array} \quad \begin{array}{r}\$1.21\\ \underline{+3.89}\end{array}$ $\qquad$ (13) $\begin{array}{r}1.25\\ \underline{+\ .75}\end{array} \quad \begin{array}{r}.75\\ \underline{+1.25}\end{array}$

(14) $\frac{2}{7} + \frac{4}{7} =$ _____ $\quad \frac{4}{7} + \frac{2}{7} =$ _____ $\qquad$ (15) $\frac{2}{3} + \frac{3}{4} =$ _____ $\quad \frac{3}{4} + \frac{2}{3} =$ _____

Here is a subtraction problem:

(16) $385 - 146 =$ ________

What happens if the order in subtraction is reversed?

(17) $146 - 385 =$ ________

If the order of the numbers in a subtraction exercise is changed, are the same numbers obtained as answers? ______________________

NAME________________________ DATE______________ SCORE__________ NO. 204

GROUPING NUMBERS FOR ADDITION

Add these three numbers: 5 + 8 + 2 =

Did you notice what you had to do? You had to add two of the numbers and then add the third. Only two numbers can be added at a time. Since this is true, we want to know whether the way we pair the numbers makes a difference in addition. What is your guess? ________

In the example above, which did you think? 5 + 8 + 2 is 13 + 2 which is ________ or did you think 5 + 8 + 2 is 5 + 10 which is ________. Write the answer and underline the way you did the example.

A symbol like this ( ) tells us which numbers to add first. These are called parentheses. Find the total of the following.

1. (13 + 17) + 29 = ________ 13 + (17 + 29) = ________
2. (462 + 93) + 7 = ________ 462 + (93 + 7) = ________
3. (21 + 5) + 4 = ________ 21 + (5 + 4) = ________
4. (4 + 7) + 2 = ________ 4 + (7 + 2) = ________
5. 46 + (73 + 98) = ________ (46 + 73) + 98 = ________
6. 28 + (75 + 25) = ________ (28 + 75) + 25 = ________
7. (6 + 1) + 9 = ________ 6 + (1 + 9) = ________
8. (45 + 15) + 63 = ________ 45 + (15 + 63) = ________
9. (13 + 36) + 4 = ________ 13 + (36 + 4) = ________
10. 63 + (75 + 25) = ________ (63 + 75) + 25 = ________

Did you notice that sometimes one choice was easier than the other? Go back and check the ones in the right hand column which were easier than their partners on the left.

In each case the way you grouped the numbers for addition did not change the final sum.

Look at the following subtraction examples.

11. 35 - (19 - 4)
35 - (15) = ________

12. (35 - 19) - 4
(16) - 4 = ________

13. Does the way you group the numbers for subtraction affect the answer? ________________

Can you add these numerals quickly without pencil and paper by grouping by tens?

14. 4 + 8 + 6 + 2 + 10 + 9 + 3 + 1 + 7 = ____________

NAME ________________ DATE ____________ SCORE __________ NO. 205

ORDER IN MULTIPLICATION

Suppose we have 6 rows of chairs with 4 in each row. We decide to change the arrangement to make 4 rows of chairs with 6 chairs in each row. Do we need more chairs?

* * * * * * * * * * * * * * * * (6 x 4) * * * * * * * *	* * * * * * * * * * * * * * * * * * (4 x 6) * * * * * *

Mary's club has a cookie sale. There are 32 girls in the club. Each girl brings 12 cookies. How many cookies will they have?

this way $\begin{array}{r} 32 \\ \times\ 12 \\ \hline \end{array}$ or this way $\begin{array}{r} 12 \\ \times\ 32 \\ \hline \end{array}$

The product of 2 numbers is the same, whether the first is multiplied by the second or the second is multiplied by the first. The order in which two factors are multiplied does not affect the answer in multiplication.

Tell whether the following sentences are true or false: If true, give the product.

(1) 15 x 7 = 7 x 15 T 105

(2) 31 x 24 = 24 x 31 ____ ____

(3) .6 x .3 = .3 x .6 ____ ____

(4) 158 x 21 = 21 x 851 ____ ____

(5) $\frac{1}{2} \times \frac{1}{4} = \frac{1}{4} \times \frac{1}{2}$ ____ ____

(6) 60 ÷ 20 = 20 ÷ 60 ____ ____

(7) 6.78 x .12 = .12 x 6.78 ____ ____

(8) 3.7 x .45 = .45 x .37 ____ ____

(9) a x b = b x a ____ ____

(10) 987 x 55 = 55 x 9.87 ____ ____

(11) 90 x 60 = 60 x 90 ____ ____

(12) 0 x 423 = 432 x 0 ____ ____

Check the following multiplication problems by reversing the factors. Tell why this serves as a check.

(13) $\begin{array}{r} 17 \\ \times\ 32 \\ \hline \end{array}$ $\begin{array}{r} 32 \\ \times\ 17 \\ \hline \end{array}$ (14) $\begin{array}{r} .61 \\ \times\ .12 \\ \hline \end{array}$ $\begin{array}{r} .12 \\ \times\ .61 \\ \hline \end{array}$ (15) $\frac{3}{5} \times \frac{1}{2} =$ $\frac{1}{2} \times \frac{3}{5} =$

(16) Can order in division be changed without affecting the quotient? ______

Show by an example.

NAME ______________________________ DATE _______________ SCORE _________ NO. 206

WHAT DO YOU KNOW ABOUT NUMBERS? (Review)

Finish the number exercise. In the sentence underline the correct word or phrase inside the parentheses which makes the sentence true.

1. 8 + 0 = 8 The sum of any number and zero is (the number, zero)
2. 9 - _____ = 0 Any number minus (zero, itself) equals zero
3. The next consecutive odd number after 7 is ______ The difference between consecutive odd numbers is (one, two)
4. The next consecutive even number after 152 is _____ The difference between consecutive even numbers is (one, two)
5. 9 - 7 = _____ The difference between two consecutive odd numbers is (odd, even)
6. 10 - 8 = ____ The difference between two consecutive even numbers is (odd, even)
7. 13 + 17 = ____ The sum of any two odd numbers is (even, odd)
8. 16 - 4 = _____ The difference between any two even numbers is (even, odd)
9. 6 x 0 = ______ The product of any number and zero is (the number, zero)
10. 5 x 1 = ______ The product of any number and one is (the number, one)
11. $\frac{4}{4}$ = ______ The quotient when any number (not zero) is divided by itself is (one, zero)
12. $\frac{3}{1}$ = ____ The quotient when any number is divided by one is (zero, the number)
13. 6 x 8 = _____ The product of any 2 even numbers is (even, odd)
14. 3 x 5 = _____ The product of any 2 odd numbers is (even, odd)
15. 6 x 7 = _____ The product of any even number and any odd number is (even, odd)
16. 11 x ____ = 0 If the product of 2 numbers is zero, at least one of the numbers is (one, zero)
17. 7 + 8 = ____ The sum of an odd number and an even number is (even, odd)
18. 13 - 0 = _____ A number minus zero is (the number, zero)

Are these answers correct? If not, place the correct answer below the problem.

19. Multiply $\begin{array}{r} 307 \\ 4 \\ \hline 1268 \end{array}$

20. Subtract $\begin{array}{r} 650 \\ 648 \\ \hline 18 \end{array}$

21. Subtract $\begin{array}{r} 931 \\ 929 \\ \hline 2 \end{array}$

22. Multiply $\begin{array}{r} 486 \\ 61 \\ \hline 468 \\ 2916 \\ \hline 29628 \end{array}$

23. $\frac{328}{328} = 0$

24. $\frac{328}{1} = 0$

25. 27 x 0 = 27

26. 86 - 0 = 0

27. $\frac{0}{3} = 0$

28. $\frac{1}{1} = 0$

NAME ______________________ DATE ____________ SCORE ________ NO. 207

FACTORING

When whole numbers are multiplied together to give a product, these numbers are called factors. For example, 15 = 3 x 5. Here 3 and 5 are called factors of 15. In another example, 2 x 3 x 5 = 30. 2, 3, and 5 are called factors of 30. Since 1 is a factor of all numbers, it is usually not listed in the set of factors of a number.

Find the product when the factors are:

1) 2, 2 and 2 ______
2) 2, 3 and 5 ______
3) 2, 2, 3 and 5 ______
4) 3, 4, 5 and 7 ______
5) 2, 2, 3, 3 and 5 ______
6) 2, 2, 3, 5, and 5 ______

Factor these numbers: Example, 20 = 2 x 2 x 5 or 20 = 4 x 5 or 20 = 2 x 10.

7) 21: ______
8) 25: ______
9) 42: ______
10) 18: ______
11) 27: ______
12) 35: ______
13) 49: ______
14) 63: ______
15) 55: ______

Factor these numbers in as many different ways as possible, using only 2 factors at a time.

Example: 12: 2 x 6; or 3 x 4; or 12 x 1

16) 16: ______________________________
17) 24: ______________________________
18) 5: ______________________________
19) 36: ______________________________
20) 13: ______________________________
21) 40: ______________________________
22) 48: ______________________________
23) 7: ______________________________
24) 19: ______________________________
25) 22: ______________________________
26) If a number has only 2 different factors, itself and one, it is called a prime number. List the numbers, from the above, which you found to be prime numbers. ______________________
27) Find the prime numbers between 10 and 50. ______________________

NAME__________________________ DATE_____________ SCORE________ NO. 208

MORE ABOUT FACTORING

When whole numbers are multiplied together to give a product, these numbers are called factors.

Example: 12 = 3 x 4

The factors of 12 are 3 and 4. Which of these factors may be factored again? __________________How? __________________

Then 12 can also be factored as 3 x 2 x 2. 3 and 2 are the prime factors of 12.

Find the prime factors which give the following products?

1) 18: 2 x 3 x 3
2) 20: ________
3) 8: ________
4) 28: ________
5) 130: ________
6) 42: ________
7) 16: ________
8) 27: ________
9) 50: ________
10) 11: ________
11) 30: ________
12) 40: ________

Look at the numerals in the boxes $\boxed{3}\boxed{4}\boxed{12}$ Four number facts can be made from these numerals:

3 x 4 = 12 12 ÷ 3 = 4
4 x 3 = 12 12 ÷ 4 = 3

Make up four number facts from the following sets of numerals:

13) 8 24 3 _____ _____ _____ _____
14) 3 5 15 _____ _____ _____ _____

What number placed in the box makes this number sentence true?

$45 = 9 \times \square$ The number in the box should be 5.

15) $100 = 50 \times \square$
16) $36 = 9 \times \square$
17) $24 = 4 \times \square$
18) $4 = \frac{1}{2} \times \square$
19) $\frac{1}{12} = \frac{1}{3} \times \square$
20) $180 = \square \times 15$

21) If you are given one or more factors of a number, can you find the missing factor? _________________________

In working with numbers, it is useful to be able to find a factor common to several numbers. For example 6 = 2 x 3 and 15 = 5 x 3. What is a factor common to both 6 and 15? ______ Find the common factor of the following sets of numbers:

(a) 4, 6 ____ (b) 12, 15 ____ (c) 14, 21 ____ (d) 26, 39 ____

NAME______________________ DATE__________ SCORE_______ NO. 209

COMMON MULTIPLES

When you work with fractions, you will need to use least common multiples. You know about the multiplication tables. The table for 7, includes 7, 14, 21, 28, 35, 42, and so on. These numbers are all multiples of seven.

Look at this list of numbers:

3: 3, 6, 9, 12, 15, 18, 21, ---
4: 4, 8, 12, 16, 20, 24, 28, ---
6: 6, 12, 18, 24, 30, 36, 42, ---

The numbers in the first row are multiples of 3. The multiple which follows 21 is _____. The next two multiples of 3 are ____ and ____.

The numbers in the second row are multiples of _____. The multiple of 4 which follows 28 is ____. The next two multiples of 4 are ____ and ____.

The numbers in the third row are multiples of _____. The multiple of 6 which follows 42 is _____. The next two multiples of 6 are ____ and ____.

Is there a multiple of 3 which is also a multiple of 4? _____ Name one _____.
Is there a multiple of 3 which is also a multiple of 6? _____ One is _______.
Is there a multiple of 4 which is also a multiple of 6? _____ One is _______.

Write two numbers which are multiples of 3 and 4. ____ ____. When you find a number which is a multiple of 3 and 4 you have found a common multiple of 3 and 4. Name the smallest common multiple of 3 and 4. ______.

Find a common multiple for 3, 4, and 6 from the above lists. ________

Find the smallest common multiple for the following sets of numbers:

1. 2, 3 ______
2. 3, 5 ______
3. 4, 5 ______
4. 3, 8 ______
5. 6, 8 ______
6. 2, 5 ______
7. 2, 3, 4 ______
8. 2, 4, 8 ______
9. 2, 3, 5 ______
10. 3, 4, 7 ______

11. Find all the common multiples of 3, 4, and 8 which are less than 75 _____ _____ _____

12. In adding fractions you may use any common multiple of the denominators as a common denominator. Name a common multiple of the denominators in each of the following examples:

(a) $\frac{7}{8} + \frac{3}{4}$ _____ (b) $\frac{2}{3} + \frac{5}{8}$ _____ (c) $\frac{1}{3} + \frac{3}{4} + \frac{1}{2}$ _____

13. Did you use the least common multiple in problem 12? _____ Why? _________

NAME______________________ DATE____________ SCORE________ NO. 210

FRACTIONS AND RATIOS

This is the diagram of a classroom. ● means girl. X means boy.
The names above the box are the names of the pupils in the first seats.

Wanda	Betty	Alex	Tom	Pauline
●	●	X	X	●
X	●	X	●	●
●	X	●	X	●
X	●	X	●	X
●	X	●	X	●
X	●	X	●	X

A ratio is a quotient. The ratio of 3 to 7 is $\frac{3}{7}$. The ratio of the number of girls to the number of boys in Pauline's column is $\frac{4}{2}$ or $\frac{2}{1}$ or 2.

1. What is the ratio of the number of boys to the number of pupils in the entire class? ______________
2. What part of the entire class is girls? ______________
3. What is the ratio of the number of boys to the number of girls in the class? ______________
4. If Wanda and Betty are absent, what part of the class is absent? ______
5. Tom is ill. What part of the entire class is ill? ______________
6. The entire last row is the bulletin board committee this month. What is the ratio of the number of pupils on this committee to the number of pupils in the entire class? ______________
7. If 24 of the 30 members of the class joined the Pep Club, what part of the class joined? __________ What is the ratio of the number of those who joined to the number of those who did not join? ______________
8. Alex and another boy are on the school basketball team. What is the ratio of the number of boys on the team to the number of boys in the class? ______________
9. Half of the girls and half of the boys bring lunches to school. What part of the class brings lunches to school? ______________
10. If the entire class is divided into six equal groups, how many pupils are in each group? ________ What is the ratio of the number in each group to the number of pupils in the entire class? ______________

NAME ______________________ DATE ____________ SCORE ________ NO. 211

COOKING

Sylvia is learning to bake. The recipe her mother gave her is for a two layer cake. Since this is her first cake, Sylvia wants to use $\frac{1}{2}$ the recipe.

1. The recipe is given below. Find the amounts she should use to make one layer.

Original Recipe	Sylvia's Recipe
3 cups cake flour	____________
1 cup sugar	____________
$\frac{3}{4}$ cup milk	____________
$\frac{1}{4}$ teaspoon vanilla	____________
2 eggs	____________
$\frac{1}{2}$ tablespoon baking powder	____________

2. If the original recipe makes 2 layers, how many layers should Sylvia's recipe make? ____________

3. Sylvia's cake was so good that she decided to double the original recipe next time. How many layers will she then make? ________

4. What amounts of each of the items in the original recipe should Sylvia then use?

cake flour ________

sugar ________

milk ________

vanilla ________

eggs ________

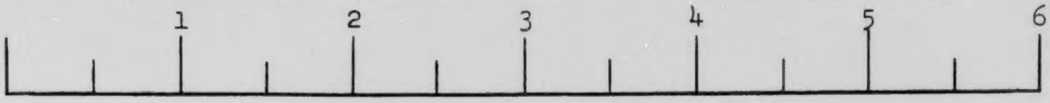
baking powder ____

5. A candy recipe is given below. Complete the following chart.

	Half Recipe	Double Recipe
$\frac{2}{3}$ cup sirup	__________	__________
$1\frac{1}{3}$ cups brown sugar	__________	__________
$\frac{1}{4}$ cup butter	__________	__________
$\frac{1}{2}$ tablespoon flavoring	__________	__________

NAME________________________ DATE______________ SCORE__________ NO. 212

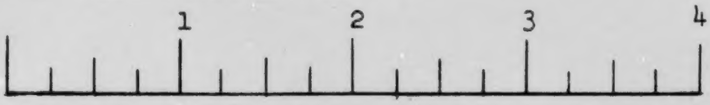
GETTING READY FOR DIVISION OF COMMON FRACTIONS (Number Line)



1. How many $\frac{1}{2}$ inches in 1 inch? ________ 2 inches? ________ 3 inches? ________

   4 inches? ________ $4\frac{1}{2}$ inches? ________ 5 inches? ________

2. In each case in number 1 there are how many times as many $\frac{1}{2}$ inches as there are inches? ____________________



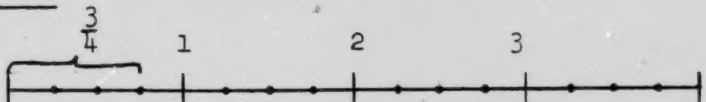
3. Each inch on the line above is divided into how many equal parts? ________

4. What fractional part of an inch is each division? ______________

5. How many $\frac{1}{4}$ inches in 1 inch? ________ 2 inches? ________

   $2\frac{1}{2}$ inches? ________ 3 inches? ________ 4 inches? ________

6. In Exercise 5, there are how many times as many $\frac{1}{4}$ inches as there are inches? __________

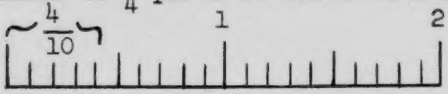


7. Each unit on the above number line is divided into 4 equal parts.

   Each part is ____________________ of a unit.

8. Three of these parts are ________________ of a unit.

9. Count the number of $\frac{3}{4}$ parts it takes to make 3 units.



10. Into how many parts is each unit on the above number line divided? ______

11. 4 of these parts is what part of the unit? ______________

12. How many of these $\frac{4}{10}$ parts does it take to make 2 units? ________________

13. How many of these $\frac{4}{10}$ parts does it take to make 3 units? ________________

14. How many of these $\frac{4}{10}$ parts does it take to make 6 units? ________________

15. How many $\frac{1}{3}$'s in 2 units? ______________

NAME____________________ DATE____________ SCORE________ NO. 213

DIVISION OF COMMON FRACTIONS (Reciprocal)

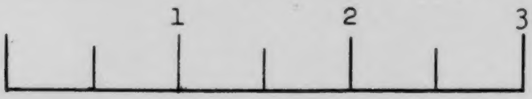
Find the following products:

1. $\frac{1}{5} \times \frac{5}{1} =$ _____ $\frac{10}{1} \times \frac{1}{10} =$ _____ $\frac{1}{4} \times \frac{4}{1} =$ _____ $\frac{2}{3} \times \frac{3}{2} =$ _____

Pairs of numbers like these which have 1 as their product are called reciprocals. $\frac{1}{5}$ is the reciprocal of 5 and 5 is the reciprocal of $\frac{1}{5}$. What is a shorter name for $\frac{5}{1}$? _______ For $\frac{10}{1}$? _______

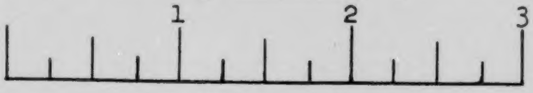
Give the reciprocals of the following:

2. $\frac{7}{8}$ _____ 6 _____ $\frac{99}{4}$ _____ $\frac{37}{3}$ _____



3. How many $\frac{1}{2}$ inches are in 3 inches? _______ Then $3 \div \frac{1}{2} =$ _______

What is the reciprocal of $\frac{1}{2}$? _______ $3 \times 2 =$ _______



4. How many $\frac{3}{4}$ inches are in 3 inches? _______ Then $3 \div \frac{3}{4} =$ _______

What is the reciprocal of $\frac{3}{4}$? _______ $3 \times \frac{4}{3} =$ _______

5. Is dividing $\frac{2}{1}$ by $\frac{4}{10}$, the same as multiplying $\frac{2}{1}$ by $\frac{10}{4}$? _______

6. Does dividing by a number give the same answer as multiplying by the reciprocal of the number? ______________

7. $9 \div \frac{1}{2}$ or $9 \times \frac{2}{1} =$ _______

8. $16 \div \frac{1}{8} =$ _______

9. $\frac{3}{8} \div \frac{1}{4} =$ _______

10. $7 \div \frac{2}{3} =$ _______

11. $24 \div \frac{2}{3} =$ _______

12. $\frac{3}{2} \div \frac{3}{4} =$ _______

13. $5 \div \frac{5}{2} =$ _______

14. $\frac{1}{2} \div \frac{4}{1} =$ _______

15. $10 \div \frac{2}{5} =$ _______

16. $2\frac{1}{2} \div 8 =$ _______

NAME______________________________ DATE_______________ SCORE__________ NO. 214

THOUGHT PROBLEMS

1. Henry wants a football that costs $3.29. He has only $.75. How much more does he need? _______________

2. Ted had $9.00 in his bank. Last week he withdrew $3. How much money does Ted have in his bank now if he earned $1.03 this week and put this money in the bank too? ______________

3. Alice's mother gave her 15¢ each school day this week. How much money did she have at the end of the week if she did not spend any of it? ____

4. Ralph earned $3.29 Friday and $4.65 on Monday. How much money did he earn? _______________

5. Blanche has 65¢. How many 4-cent stamps can she buy? ____________ Will she have any money left? ____________ How much? ______________________

6. A class wants 3 pounds of potato chips for a picnic. The chips come in $\frac{1}{4}$ lb. cellophane bags. How many bags should the class buy to get 3 lbs.? _________________

7. If flashlight bulbs cost 2 for 15¢, 6 bulbs will cost how much? ________

8. If you have 24 apples, how many dozen do you have? ______________

9. If you know that your bus leaves at 3:10 p.m. and you wish to allow a half hour to get to the station and buy your tickets, you should leave home at what time? _________________

10. If each student in your class today has 25¢, how much money does the whole class have? _______________

11. Try to arrange the following numerals in six different ways.

    2, 3, 4

12. Make up and write out below a problem of your own. Find the answer.

NAME____________________ DATE__________ SCORE________ NO. 215

ROUNDING DECIMAL FRACTIONS

The names of the positions we use in our numeration system are important to us as we round decimal fractions. Name the positions and then check your success by comparing your names with the correct names on the diagram. Notice that the decimal point marks the "ones" place.

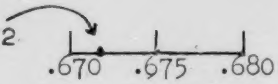
←-----whole number ------------•---------------fraction--------------→

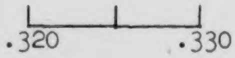
hundreds	tens	ones	tenths	hundredths	thousandths

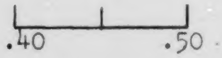
We use the same thinking in rounding decimal fractions that we use in rounding whole numbers. A number line helps us to decide upon the number to which we will round the number we have in mind.

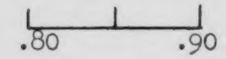
(1) Which decimal fraction corresponds to the middle point of the first number line below? __________ Write the decimal name of the midpoint of each line below.

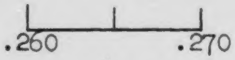
Then locate the given decimal fraction on the given line as shown in the example.

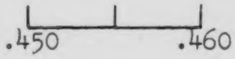
Example: .672


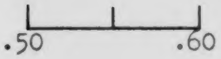
(6) .327


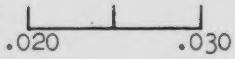
(2) .48


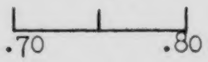
(7) .88


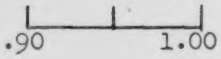
(3) .269


(8) .452


(4) .53


(9) .024


(5) .75


(10) .9126


Sometimes it helps if you mark the place to which you want to round the number.

Example: Round 4.382 to the nearest hundredth.
Mark the hundredth place 4.3$\overset{\downarrow}{8}$2 and then think, "Is .382 closer to .380 or .390?" It is closer to .380 so 4.382 rounded to the nearest hundredth is 4.38.

Round the following to the nearest hundredth:

(11) .672 ________ hundredth
(12) .327 ________ hundredth
(13) .483 ________ hundredth

NAME ______________________ DATE ____________ SCORE ________ NO. 216

EXPENSE ACCOUNTS

1. To learn to live within your income, you must keep account first of what you spend on various items. Then plan in advance how you wish to spend your money in the future. This plan is a budget. Find the totals for each day of the week and for each kind of item and complete the table below showing Tom's expense account.

	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Total
Bus Fare	$.30	$.30	$.30	$.30	$.30	$.50	
Lunch	$.38	$.35	$.33	$.38	$.31		
Recreation						$.50	
Savings	$.25						
TOTALS							

a. How much did Tom spend for bus fare? ____________

b. How much did he spend for recreation? ____________

c. How much money did he have for the week? __________

d. What is the ratio of the money he spent for recreation to the money he had for the week? ______________

2. Find the total for each day of the week and for each kind of item and complete the table showing Mrs. Frank's food account.

	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Total
Meats	$.75	$2.00	$1.65	$ .98	$.69	$3.00	
Produce	2.50	3.00	1.30	1.20	1.05	10.00	
Miscellaneous Groceries	.75	.35	.50	1.10	.35	2.00	
TOTALS							

a. What is the ratio of the money spent for produce to the total cost for the week? ______________

b. How much money do you think Mrs. Frank should set aside for food for next week? ______________

DS

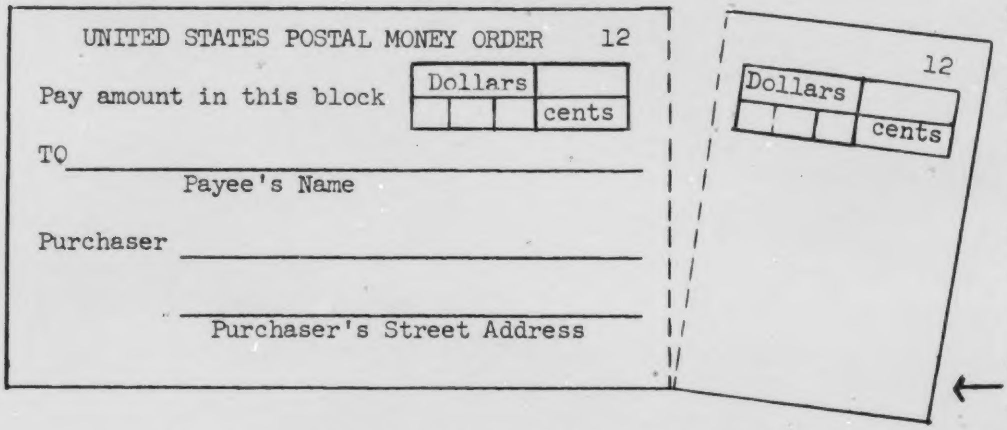
MONEY ORDERS
DOMESTIC
AMOUNT OF ORDER
FEE
RAMMES

PUPIL EXPERIENCES FURNISH MATERIAL FOR LESSONS

NAME ______________________ DATE ______________ SCORE ________ NO. 217

MONEY ORDERS

Money orders may be used to send money safely by mail. They are bought at the post office, drug store, or in some grocery stores. The money order has two parts. The name of the person or the company (payee) to whom the money order is payable is written on the order. So are the name and address of the purchaser (sender).



UNITED STATES POSTAL MONEY ORDER 12

Pay amount in this block | Dollars | cents |

TO ______________________

Payee's Name

Purchaser ______________________

____

Purchaser's Street Address

12

| Dollars | cents |

This is the part which is kept by the person who buys the money order

Assume that you wish to pay $19.50 to the Acme Supply House. Fill in the money order above.

The post office charges a fee for this service. The fees are listed. How much is the fee for a money order for these amounts?

Amount	Fee
$ .01 to $ 10.00	$.20
$10.01 to $ 50.00	.30
$50.01 to $100.00	.35

	AMOUNT	FEE		AMOUNT	FEE
1.	$ .50	$.20	5.	$10.01	____
2.	$93.67	____	6.	$89.50	____
3.	$55.00	____	7.	$19.50	____
4.	$ 5.00	____	8.	$10.30	____

Money orders cannot be purchased in amounts over $100. To pay a bill of $140, a person buys a $100 and a $40 order.

When you buy a money order, you tell the clerk how much money the order is for. You pay him this amount plus the fee. For example:

	AMOUNT		FEE		MONEY PAID TO CLERK		AMOUNT		FEE		MONEY PAID TO CLERK
9.	$ 9.50	+	$.20	=	$ 9.70	14.	$ 1.50	+	____	=	________
10.	$35.50	+	____	=	________	15.	$130.50	+	____	=	________
11.	$42.75	+	____	=	________	16.	$105.00	+	____	=	________
12.	$15.00	+	____	=	________	17.	$265.25	+	____	=	________
13.	$ 5.95	+	____	=	________	18.	$108.75	+	____	=	________

NAME______________________________ DATE______________ SCORE__________ NO. 218

SALES TAX

Sales tax is a tax paid by a person when he buys certain articles. The tax is collected by the seller and is paid to the state or city government for use as public funds. In Ohio the state sales tax rate is as follows:

No tax	$.01 to $ .30
$.01	$.31 to $ .40
$.02	$.41 to $ .70
$.03	$.71 to $1.08

For purchases over $1.08 the rate is $.03 on each dollar

plus
$.01 tax for $.09 to $.40
$.02 tax for $.41 to $.70
$.03 tax for $.71 to $.99
for fractional parts of $1.

For example, on a $1.19 purchase the tax is $.03 on the $1.00 and $.01 on the $.19 making a total tax of $.04. If more than one taxable item is purchased, the tax is paid on the total cost.

1. Find the sales tax on each of the following purchases:

a. $2.60 ________ d. $136.98 ________
b. $9.40 ________ e. $7.10 ________
c. $48.50 ________ f. $850.00 ________

2. How much sales tax is paid on a purchase of a taxable article which costs 55 cents? ____________
3. What is the tax on an article which costs $1? ________
4. What is the tax on an item which costs $1.25? ________
5. What is the tax on a hammer which costs $3.75? ________
6. What is the tax on a pound of nails which costs $.45? __________
7. What is the tax on the hammer and nails in problems 5 and 6, if they are bought at the same time? ____________
8. How does the tax in problem 7 compare with the sum of taxes in problems 5 and 6? (less, same, more) ______________
9. What is the tax on a package of paper which costs 25 cents? _________
10. What is the tax on a jar of paste which costs 45 cents? ____________
11. What is the tax on a 15¢ brush? ____________
12. What is the tax on the items in problems 9, 10, and 11 if they are bought at the same time? _______________
13. How does the tax in problem 12 compare with the sum of the taxes in problems 9, 10, and 11? (less, same, more) ____________

NAME________________________ DATE____________ SCORE________ NO. 219

MULTIPLYING DECIMAL FRACTIONS

A. (1) $.25 \times .3 = \frac{25}{100} \times \frac{3}{\underline{\quad}} = \frac{\underline{\quad}}{1000}$ Write this answer as a decimal fraction ________

(2) $.3 \times 127 = \frac{\underline{\quad}}{10} \times \frac{127}{1} = \underline{\quad}$ Write this answer as a decimal fraction ________

(3) $4.3 \times 2.1 = 4\frac{3}{10} \times 2\frac{1}{10}$

$\frac{43}{\underline{\quad}} \times \frac{\underline{\quad}}{10}$ Write this answer as a decimal fraction ________

Count the number of places to the right of the decimal point in:

(4) Ex.(1) (a) in the first factor_____ (b) in the second factor_______
(c) in the product _________

(5) Ex.(2) (a) in the first factor_____ (b) in the second factor_______
(c) in the product _________

(6) Ex.(3) (a) in the first factor_____ (b) in the second factor_______
(c) in the product _________

(7) How do we decide where to place the decimal point in a product?

____

B. Place the decimal point in the following products so that the number sentence is true.

(8) .4 x .3 = 12
(9) 4.2 x 3.8 = 1596
(10) 3.14 x 12 = 3768
(11) 7.65 x 5.2 = 39780
(12) .28 x .7 = 196
(13) .5 x .14 = 70

C. Multiply the following and place the decimal point correctly in your answer.

(14) $\begin{array}{r} 6.8 \\ \underline{4} \end{array}$

(15) $\begin{array}{r} 234 \\ \underline{.07} \end{array}$

(16) $\begin{array}{r} 2.48 \\ \underline{2.5} \end{array}$

(17) $\begin{array}{r} 4010 \\ \underline{7.15} \end{array}$

(18) $\begin{array}{r} 19.570 \\ \underline{3} \end{array}$

(19) $\begin{array}{r} 61.8 \\ \underline{.42} \end{array}$

(20) Mr. Long bought 7.5 gallons of gasoline at 31¢ per gallon. How much did he pay for the gasoline? ____________

NAME________________________________ DATE______________ SCORE__________ NO. 220

ESTIMATION AND MULTIPLICATION OF DECIMAL FRACTIONS

Estimating answers can be helpful in placing decimal points in the proper place. Study the following examples to learn how to estimate.

1. 12 x .8 Since .8 is approximately 1, the answer will be close to 12 because 12 x 1 = _____. Will the answer be larger or smaller than 12? ______ Multiply 12 by .8. What is your answer? _________

2. 9.3 x 11 Estimate 10 x 10 = _____. Find the product of 9.3 and 11. _______ Is the product close to the estimate? _________

3. 2.22 x 3.7 Estimate 2 x 4 = ______. Find the product of 2.22 and 3.7. ___________ Is the product close to the estimate? __________

In the following exercises, write the numbers you will use to get an estimate. Record your estimate and compute the actual product.

	Exercise	Numbers Multiplied for Estimate	Estimate	Product
4.	15.3 x 27	15 x 30	450	413.1
5.	5.11 x 4.2			
6.	1.16 x 3.87			
7.	109.4 x 3.1			
8.	3.14 x 98.9			

9. Bill has $3 and wants to buy some gasoline costing 31.8¢ per gallon for his car. Does he have enough money to buy 10 gallons of gas? _________ How much money will the 10 gallons of gasoline cost? ______________

10. Find the cost of 150 pencils at 3.1¢ each. Your estimate.____________ Actual product.______________

11. A worker pays .03 of his income into a pension plan. How much will he pay into the plan during a week in which he earns $75? ______________

12. Find the cost of 15 gallons of gasoline at $.34 per gallon. __________

13. Mrs. York bought a new rug which contained 9.5 square yards. Find the cost, to the nearest cent, of the rug if it cost $8.75 per square yard. ________________

NAME______________________ DATE______________ SCORE__________ NO. 221

SEASON'S GREETINGS

● $6.50	● $1\frac{5}{6}$	● $5\frac{4}{9}$	● .17	● $12.80	● 19	● 15	● $4.20	● $2\frac{1}{3}$
● 9	● $8.60	● .09	● $26\frac{1}{2}$	● $1\frac{1}{2}$	● 7.04	● $1\frac{2}{3}$	● 9.8	● $\frac{9}{20}$
● $1.75	● $2.04	● 29	● 41	● 20	● .06	● $1\frac{3}{8}$	● $3\frac{3}{4}$	● $\frac{1}{4}$
● 103110	● $5\frac{1}{8}$	● $930	● 975	● 8	● $94\frac{4}{7}$	● $4\frac{7}{8}$	● 6	● 3.13
● 7.2	● 5	● $5\frac{4}{7}$	● $5.83	● 1800	● $2.05	● $1.50	● $9.60	● 2.31

Directions:

Work the first problem and locate the answer. Work the second problem and locate the answer. Draw a straight line from the answer in problem 1 to the answer in problem 2. Continue this through the answer to number 20. If your answers are correct, a picture will be formed.

1. Subtract $2.95 from $5.00
2. $662 \div 7$
3. $7\frac{1}{2} - 2\frac{5}{8}$
4. $2\frac{2}{5} \times 2\frac{1}{2}$
5. $3.61 - .48$
6. $\frac{1}{2} \times \frac{3}{8} \times 7\frac{1}{3}$
7. $5\frac{5}{8} \div 1\frac{1}{2}$
8. $6.12 + .03 + .89$
9. $8\frac{1}{3} \div 5$
10. $\frac{1}{5}$ of $64
11. Round .094 to the nearest hundredth
12. $14\frac{5}{6} + 11\frac{2}{3}$
13. $1 + $.29 + $.75
14. $1305 \div 45$
15. 105×982
16. $12\frac{1}{2} - 7\frac{3}{8}$
17. $\frac{1}{3}$ of $2790
18. $12\frac{1}{2} \times 78$
19. Subtract $14.17 from $20
20. Round 1785 to the nearest hundred

NAME ______________________ DATE ____________ SCORE ________ NO. 222

BUYING GROCERIES

If the cost of an item includes a fraction of a cent, the price of each item is rounded to the next higher cent.

1. How much will Jim pay for these groceries? ____________

   1 can spaghetti with meat balls at 49¢ for each can
   1 can salmon at 39¢
   1 loaf raisin bread at 20¢
   2 cans grapefruit at 2 for 49¢
   1 can pineapple juice at 2 for 49¢
   1 can pork and beans at 3 for 31¢

2. How much change will Mary receive if she pays for these groceries with 3 one-dollar bills? ____________

   3 cans milk at 3 cans for 25¢
   10 lb. bag of sugar at 95¢ for the 10 lbs.
   1 lb. margarine 25¢
   2 lbs. onions at 19¢ a pound
   1 lb. bologna at 59¢ a pound
   1 jar peanut butter at 39¢ each

3. George bought supplies for a weiner roast.

   3 boxes marshmallows at 33¢ a box
   4 lbs. weiners at 65¢ a pound
   2 dozen buns at 39¢ a dozen
   1 jar pickles at 29¢ each

   How much did the supplies cost George? __________ If eight people shared the costs equally, how much did each one owe George? __________

4. Before Mary could bake her cake she had to buy some groceries.

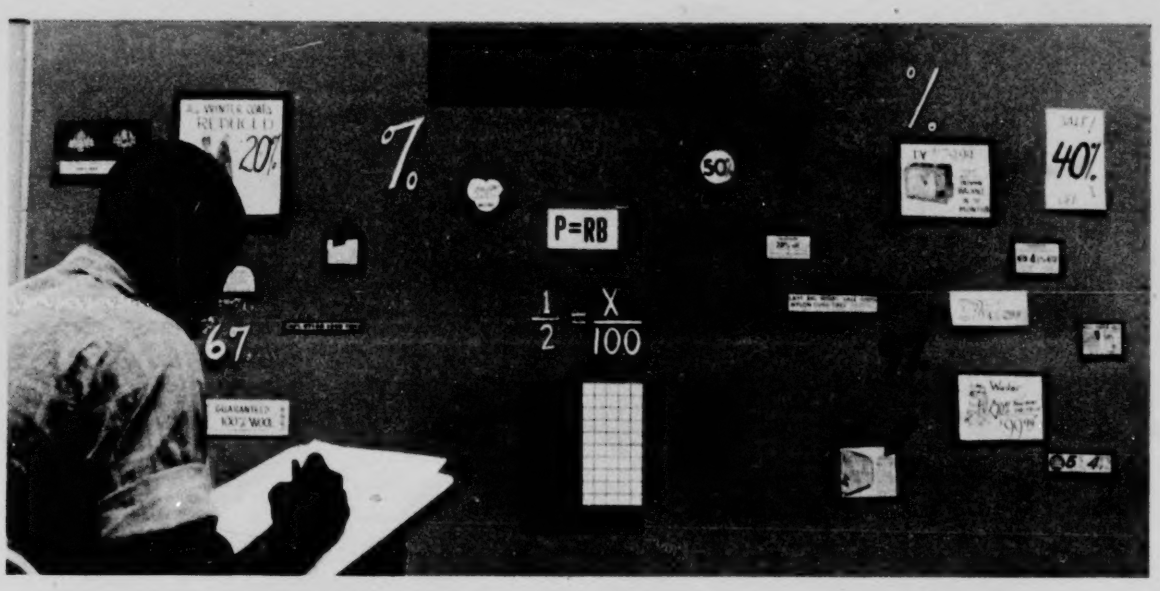
   sugar - 38¢
   cake flour - 59¢
   confectioner's sugar - $14\frac{1}{2}$¢
   vanilla flavoring - 12¢
   vegetable coloring - 25¢
   baking powder - 39¢

   What do you estimate the cost to be? ________ Actual cost __________

5. Henry and three of his pals went on an overnight camping trip. They bought:

   2 cans pork and beans at 11¢ a can
   1 pkg. potato chips at 29¢
   1 box of cereal at 25¢
   cheese crackers at 49¢
   2 loaves of bread at 26¢ a loaf
   1 dozen eggs at 53¢ a dozen
   1 lb. bacon at 65¢
   pancake mix at 25¢
   corn syrup at 23¢
   1 bar soap at 13¢

   How much did they spend? ________ If they shared the expenses equally, how much did each boy pay? __________


ALL WINTER COATS REDUCED
20%
%
P=RB
50%
%
SALE
40%
67
$\frac{1}{2} = \frac{X}{100}$
GUARANTEED 100% WOOL

AN ATTRACTIVE BULLETIN BOARD STIMULATES PUPIL INTEREST

NAME________________________ DATE__________ ______SCORE__________ NO. 223

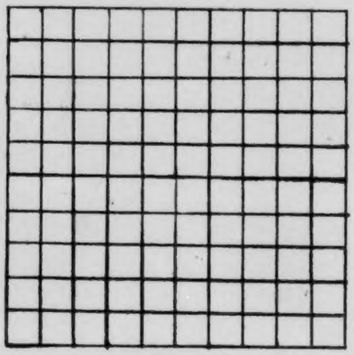
PERCENT

Read these commonly used percents: 50%, 4%, 1%, 100%.

(1) Is 50% of som thing the same as all of it? ________

(2) How do we show we mean all of something, using percent? ________

(3) Show 50% of the large square at the right by shading small squares. How many small squares did you shade. __________



(4) Express 50% as a common fraction.________

(5) Express 50% as a decimal fraction.________
The percent symbol (%) means "multiply by one-hundredth"

$$50\% = 50 \times \frac{1}{100} = \frac{50}{100} = \frac{1}{2} \qquad 50\% = 50 \times .01 = .50$$

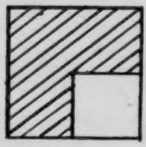
Three names for the same number are: 50%, .50, $\frac{1}{2}$

Write two more names for each of the following:

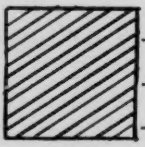
(6)	4%	.04	$\frac{4}{100}$ or $\frac{1}{25}$	(11)	.07	____	____	(16)	.24 =	____	____
(7)	52%	____	____	(12)	1%	____	____	(17)	12% =	____	____
(8)	77%	____	____	(13)	3	____	____	(18)	$\frac{1}{4}$ =	____	____
(9)	.99	____	____	(14)	18%	____	____	(19)	$\frac{400}{100}$ =	____	____
(10)	$\frac{45}{100}$	____	____	(15)	$\frac{2}{100}$	____	____	(20)	100% =	____	____

(21) John spent 20% of his allowance for school supplies, 30% for a movie ticket, 15% for a magazine, and saved the rest. What percent did he save? ____________

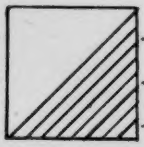
(22) In each figure below, express the part shaded in 3 ways.



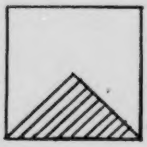
______
______
______



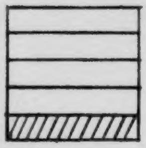
______
______
______



______
______
______



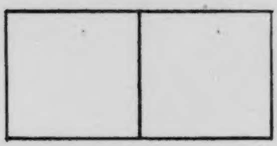
______
______
______



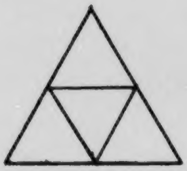
NAME ______________________ DATE ____________ SCORE ________ NO. 224

FINDING A PERCENT OF A NUMBER

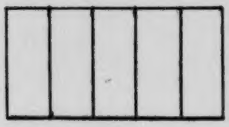
A.



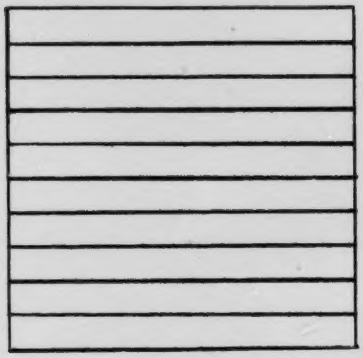
B.



C.



D.



(1) Shade 50% of drawing A. What fractional part did you shade? __________

(2) Shade 25% of drawing B. What fractional part did you shade? __________

(3) Shade 80% of drawing C. What fractional part did you shade? __________

(4) Shade 40% of drawing D. What fractional part did you shade? __________

II. Complete the following:

(1) 25% of 8 pencils : $\frac{1}{4}$ x 8 = 2 Answer: 2 pencils
(2) 10% of $30 = $ __________
(3) 50% of $12 = $ __________
(4) 75% of 16 pupils = __________ pupils
(5) $12\frac{1}{2}$% of $24 = $ __________
(6) 60% of $15 = $ __________
(7) $33\frac{1}{3}$% of $27 = $ __________
(8) 90% of 10 books = __________ books
(9) 20% of $18 = $ __________
(10) 75% of 32 cookies= __________ cookies

III. Solve the problems below:

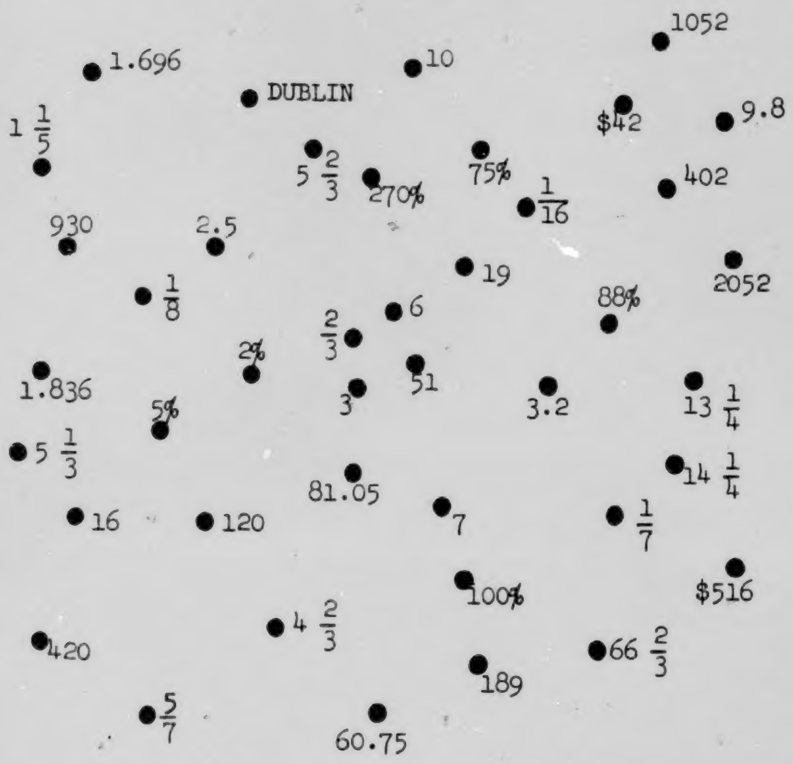
(1) If 70% of the class members are present today, what percent are absent? __________

(2) Fred works evenings after school. Last week he earned $6. If he saved 20% of this money, how much did he save? __________

(3) On certain articles there is a 10% Federal Tax. How much Federal Tax must Betty pay on a necklace which costs $9? __________

NAME________________________ DATE______________ SCORE__________ NO. 225

DRILL FOR ST. PATRICK'S DAY


1052
1.696
10
DUBLIN
1 1/5
$42
9.8
5 2/3
270%
75%
1/16
402
930
2.5
19
2052
1/8
6
88%
2/3
2%
1.836
51
3
3.2
13 1/4
5%
5 1/3
14 1/4
81.05
16
120
7
1/7
100%
$516
4 2/3
420
66 2/3
189
5/7
60.75

DIRECTIONS:

Work all the problems and draw a line around each correct answer. Locate the answer to the first problem on the picture. Draw a straight line from the answer to problem 1 to the answer to problem 2. Continue this until the picture is complete. If you work the problems correctly you'll get to Dublin and have a good Irish picture too.

GOING TO DUBLIN

1. 1/2 ÷ 3/4 (2/3) (1/8)
2. 10 x .25 (25) (2.5)
3. 33 1/3% of 2790 (390) (930)
4. 6.12 x .3 (1.696) (1.836)
5. 25% of 64 (16) (19)
6. 45 ÷ .375 (120) (5.6)
7. 5 ÷ 1 2/3 (5) (3)
8. 10 - 5 1/3 (4 2/3) (5 1/3)
9. 24.3 x 2.5 (81.05) (60.75)
10. 42% of 450 (169) (189)
11. What % of 12 is 8? (66 2/3%) (88%)
12. 5/7 x 3/15 (7) (1/7)
13. 3.57 ÷ .07 (51) (5.1)
14. .8 ÷ .25 (9.8) (3.2)
15. 5 1/2 + 7 3/4 (14 1/4) (13 1/4)
16. 57 x 36 (2052) (1052)
17. 29,346 ÷ 73 (420) (402)
18. 4% of $1050 ($516) ($42)
19. What % of 56 is 42? (75%) (88%)
20. 6 2/3 ÷ 1 1/9 (19) (6)
21. And on to Dublin

NAME____________________ DATE__________ SCORE________ NO. 226

INTEREST ON MONEY

1. What is interest? Interest is money paid for the use of ____________.

2. The amount of interest paid depends upon how long the money is used and upon how much money is loaned or borrowed. The interest rate paid by banks is a percent of the money on deposit and the period of time is __________ year.

3. How do you find 3% of $500?
   a. Write the decimal fraction name for 3% __________.
   b. Write the correct operation sign (+, -, ÷, x) .03 _____ 500
   c. 3% of $500 is $__________.

   Example: A bank pays 3% interest each year. How much interest does a deposit of $500 earn in one year?

   3% of $500

   .03 x 500 = 15 The interest is $15.

Fill in the following blanks and round to the nearest cent:

	Money in bank	Interest rate	Interest earned	Amount of money in the bank at the end of one year
4.	$350	3%	$10.50	$360.50
5.	$525	2%		
6.	$75.50	1%		
7.	$125	3%		
8.	$8020	2%		
9.	$62.48	1%		
10.	$310	$4\frac{1}{2}$%		
11.	$431	5.5%		
12.	$1750	6.7%		

NAME______________________ DATE____________ SCORE__________ NO. 227

PAYING GAS AND ELECTRIC BILLS

Write these amounts to the nearest cent:

1. $ .4360 ______
2. .6630 ______
3. .4090 ______
4. 1.165 ______
5. 32.478 ______
6. $9.78 ______
7. 9.2971 ______
8. 7.4550 ______
9. 7.8560 ______
10. 7.2010 ______

Find these amounts to the nearest cent:

11. Find 5% of $4.20 ______
12. 5% of $19.50 ______
13. 5% of $12.80 ______
14. 5% of $8.60 ______
15. 5% of $13.26 ______
16. 5% of $4.49 ______
17. 5% of $8.19 ______
18. 5% of $9.01 ______
19. 5% of $7.92 ______
20. 5% of $11.15 ______

Save by Paying Bills on Time

Your parents save money by paying the bill for gas and electric service within a stated time. This cheaper bill is called the net bill. If they wait beyond the time limit they must pay the gross bill which is 5% more. This is an example:

The net bill for November is $9.98. 5% of $9.98 is the amount saved by paying the bill on time:

$$\begin{array}{r} \$9.98 \\ \underline{.05} \\ \$.4990 \end{array}$$

The saving is $.50. The gross bill is found by adding the saving to the net bill. The gross bill is $9.98 + .50 or $10.48. Find the gross bill for the following months.

21. $12.39 - December ______
22. $19.01 - January ______
23. $28.87 - February ______
24. $18.49 - March ______
25. $ 7.10 - April ______
26. $ 6.65 - May ______
27. $ 5.85 - June ______
28. $ 7.35 - July ______
29. $ 8.45 - August ______
30. $ 8.20 - September ______
31. $ 9.10 - October ______
32. $11.50 - November ______

33. What was the total amount of extra money needed if all the twelve electric bills were paid late? ______________

NAME ______________________ DATE ______________ SCORE __________ NO. 228

MEASURES

A. 1	4	B. 4	▨	▨	C.		D.
	▨	E.	F.	G.		▨	
H.	I.	▨	J.		▨	K.	
▨	L.	M.	▨	▨	N.		▨
▨	O.		▨	▨	P.		▨
Q.		▨	R.	S.	▨	T.	U.
	▨	V.			W.	▨	
X.			▨	▨	Y.		

Write only a single digit in each white square.

ACROSS

A. Inches in 4 yards (answered for you)

C. Nine dozen

E. Feet in a mile

H. 1 quart more than 10 gallons (in quarts)

J. Ounces in 3 pounds

K. Nickels in $2.00

L. Inches in 6 feet

N. Quarters in $7.00

O. Hours in a day

P. Minutes in $1\frac{1}{4}$ hours

Q. 2 inches more than a yard

R. 1 inch more than 4 feet (total inches)

T. 3 inches less than 1 yard

V. 2 pounds more than a ton

X. Years in a century

Y. Days in 15 weeks

DOWN

A. Weeks in 2 years

B. Feet in 15 yards

C. Pints in 5 quarts

D. Cents in 8 dollars

F. Months in 2 years

G. Minutes in 1 hour and 22 minutes

I. 2 times 864

K. Four thousand, eight hundred fifty-three

M. Hours in a day

N. Feet in 9 yards

Q. Three hundred one

R. Four decades

S. 10¢ less than 1 dollar

U. Days in a year

V. Minutes in $\frac{1}{3}$ of an hour

W. 1 foot and 9 inches changed to inches

NAME______________________________ DATE______________ SCORE__________ NO. 229

METRIC UNITS OF MEASURE (Linear)

Look at the metric system table of linear measures and the American system table. Why do you think the metric system is called the more sensible?

10 millimeters = 1 centimeter	12 inches = 1 foot
10 centimeters = 1 decimeter	3 feet = 1 yard
10 decimeters = 1 meter	1760 yards = 1 mile

1000 meters = 1 kilometer	

The metric measures of distance which you hear about most often are millimeters, centimeters, meters, and kilometers. A kilometer is about .6 of a mile. A meter is 39.37 inches. Use this information and the table to help you fill in the blanks below.

(1) 1 meter = ______ decimeters (2) 1 meter = ______ centimeters

(3) 1 meter = ______ millimeters (4) 1 kilometer = _______ meters

5. 1 centimeter is what part of a meter? ______________

6. 1 millimeter is what part of a meter? ______________

7. 1 millimeter is what part of a centimeter? ____________

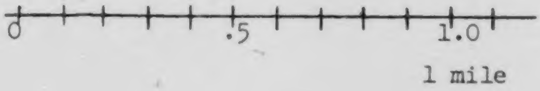
8. 1 meter is what part of a kilometer? ______________

9. Which is longer, a kilometer or a mile? ____________

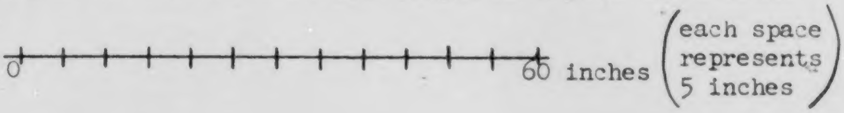
10. 40 centimeters are what part of a meter? ____________

11. How much longer is a meter than a yard? ____________

12. The drawing represents a mile. Mark the length of a kilometer on the line.



13. The drawing represents 60 inches. Mark the length of a yard and a meter on the drawing.



14. ______ centimeters = 1 meter 15. _________ft. = 1 mile

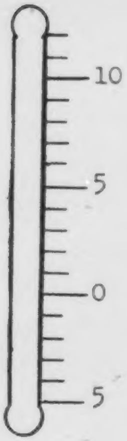
16. Which is longer, 9 meters or 10 yards? ____________________

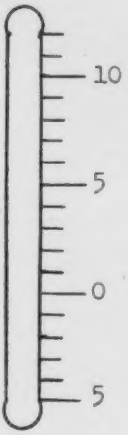
NAME ______________________ DATE ______________ SCORE __________ NO. 230

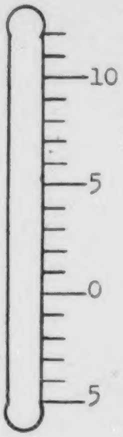
TEMPERATURE

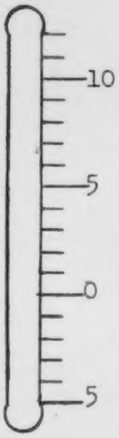
At the same time every day for 5 days Tom and Bill read the daily temperature. Shade each thermometer showing their readings.

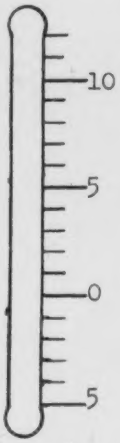
MON.	**TUES.**	**WED.**	**THURS.**	**FRI.**
temp. 9°	temp. 12°	temp. 3°	temp. 4° below zero	temp. 1° below zero











Was the reading higher or lower on Tuesday than on Monday? ____________

How much? __________

Was the reading higher or lower on Wednesday than on Tuesday? ____________

How much? __________

How did the reading change from Wednesday to Thursday? ____________

How much? __________

What change took place in the reading from Thursday to Friday? ____________

How much? __________

On which day did the boys record the highest temperature? ____________

What was it? ________

On which day did they record the lowest temperature? ____________

What was it? ________

Does zero degrees mean that there is no temperature? ____________

Tom and Bill discovered that temperatures such as 7° means 7° above zero or +7°. They also found out that temperatures below zero must be read with the word "below" or a negative sign (-).

Write their daily reading using a positive or negative sign:

Monday ___° Tuesday ___° Wednesday ___° Thursday ___° Friday ___°

NAME ____________________ DATE ____________ SCORE ________ NO. 231

READING A SCALE ON A MAP

The picture of the United States drawn on the next page is in the same shape as our country, but its size is smaller. We say the map is drawn to scale.

What is the scale? ______________________.

Fill in the table below:

Inches	Work Here	Miles
5	5 x 280 = 1400	1400
$\frac{1}{4}$		
$1\frac{1}{2}$		
		840
		140

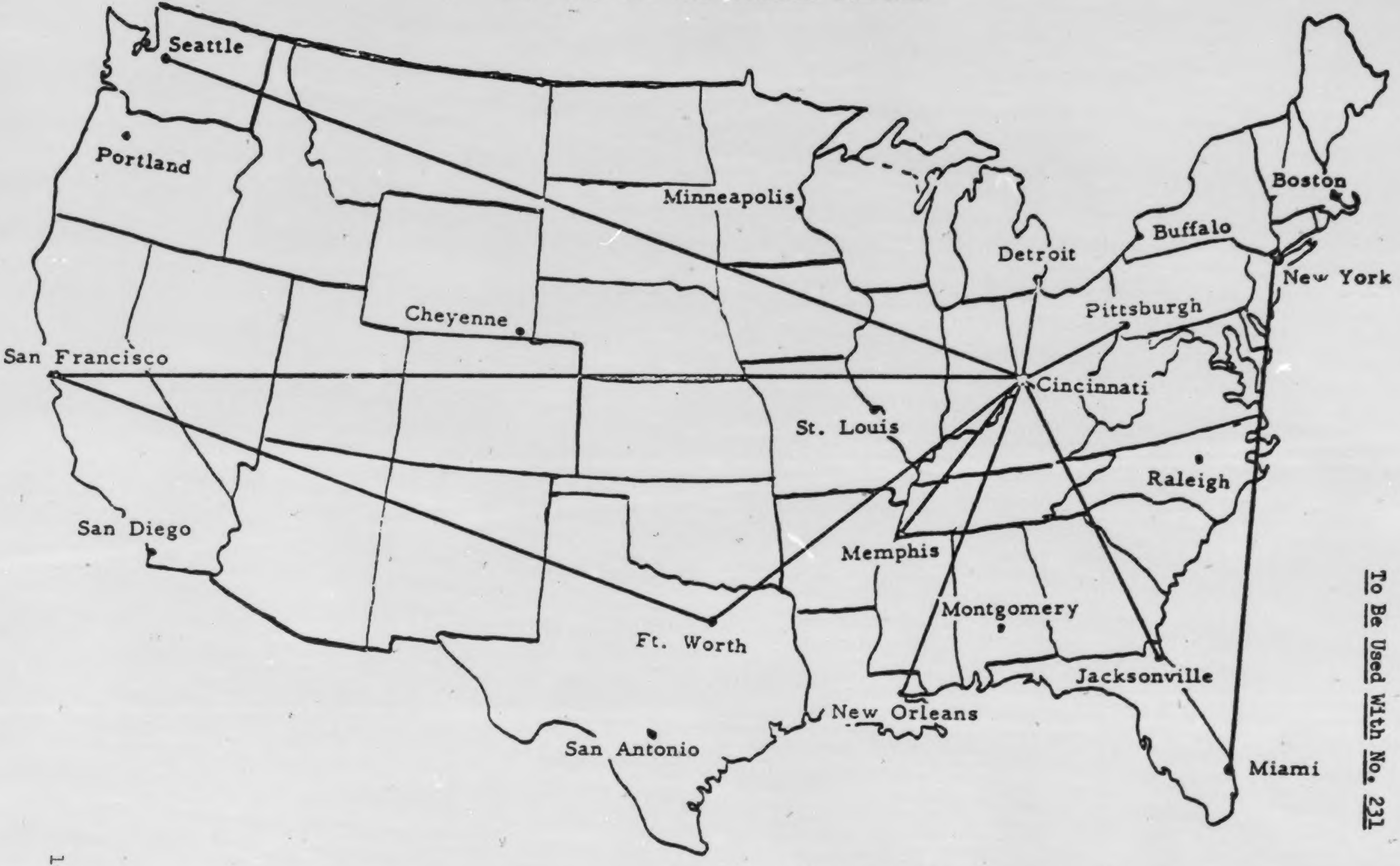
Inches	Work Here	Miles
$\frac{3}{4}$		
3		
2.5		
		2800
		3360

Use your ruler and measure to the nearest $\frac{1}{4}$" to find the following distances on the map:

	Inches	Show Work Here	Miles
Cincinnati to Pittsburgh			
Cincinnati to Seattle			
San Francisco to Ft. Worth			
New York to Miami			
Cincinnati to Jacksonville			
Cincinnati to New Orleans			
Cincinnati to San Francisco			
Ft. Worth to Cincinnati			
Cincinnati to Detroit			

1. How many feet are in 1 mile? ____________
2. How many feet are in 280 miles? ____________
3. How many inches are in 1 foot? ____________
4. How many inches are in 1 mile? ____________
5. How many inches are in 280 miles? ____________
6. What is the ratio of 1 inch to 280 miles? ____________

AIRWAYS OF THE UNITED STATES


Seattle
Portland
Minneapolis
Boston
Buffalo
Detroit
New York
Pittsburgh
Cheyenne
San Francisco
Cincinnati
St. Louis
Raleigh
San Diego
Memphis
Montgomery
Ft. Worth
Jacksonville
New Orleans
San Antonio
Miami

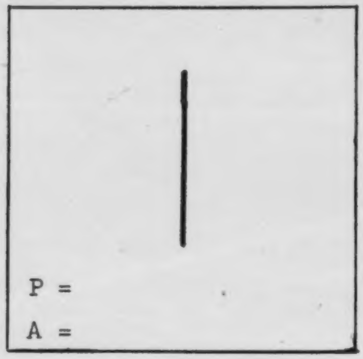
Scale: 1 inch represents 280 miles

To Be Used With No. 231

NAME____________________ DATE____________ SCORE________ NO. 232

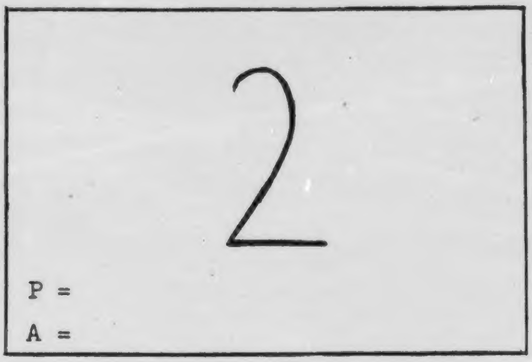
PERIMETER AND AREA (required: ruler with $\frac{1}{4}$ inch marks)

Use your ruler to find the perimeter of each figure. Then find each area. Be sure to label your answers with the correct unit, either inches or square inches.



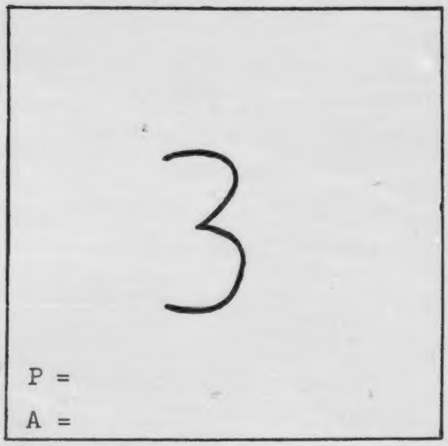
P =

A =



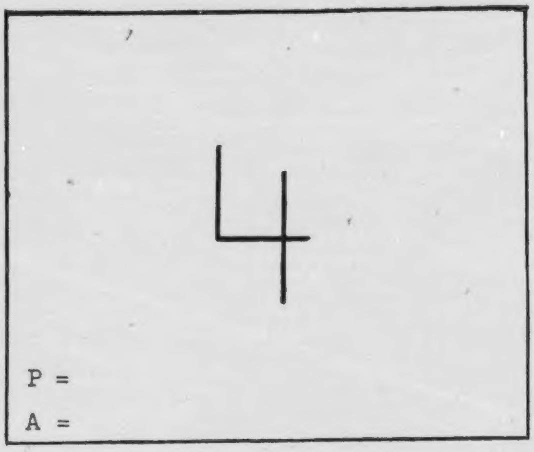
P =

A =



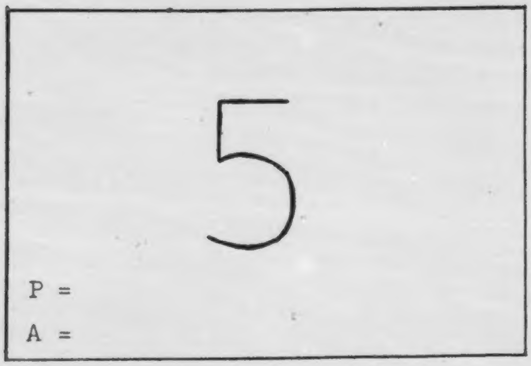
P =

A =



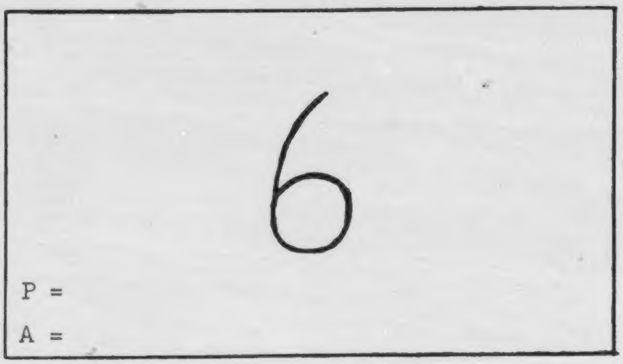
P =

A =



P =

A =



P =

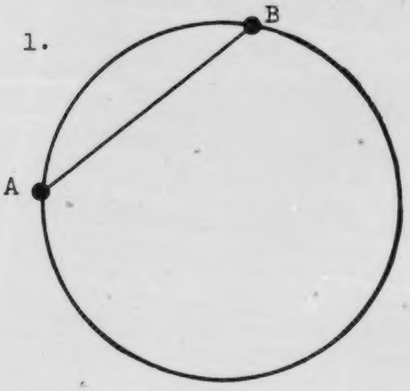
A =

NAME________________________ DATE____________ SCORE__________ NO. 233

CHORDS IN A CIRCLE (required: compasses and ruler with $\frac{1}{4}$ inch marks)

A line segment joining any two points of a circle is called a chord. It is named by its endpoints.

1.



In figure 1, the chord is AB. Its length is ______ inches. Draw another chord and label it CD. Could you have drawn CD through the center of the circle? __________

Figure 1

2. A chord which goes through the center of the circle is called a diameter.

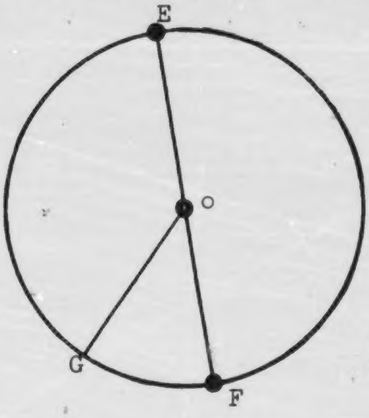


Figure 2

Find a diameter in figure 2. Name it __________. Its length is ________ inches. Could you have more than one diameter in a circle? __________ Draw 3 more diameters on the figure. The lengths of these 3 are ____, ____, ____. Write below what you found about the length of all the diameters of the same circle. ______________

____

3. A line segment from the center of a circle to any point of the circle is called a radius. Find a radius in figure 2 and write its name here.______
Could you have more than one radius of a circle? _______
Draw 2 more. Measure the radius OG in figure 2. Its length is __________.
How does this compare with the length of the ones you drew? ______________.
What is true of the length of all radii of the same circle? ______________
______________________________.

4. In Figure 2, the length of the diameter is _______. The length of the radius is ______. The ratio of the diameter to the radius is ___________.

5. Draw a circle with a radius of $1\frac{1}{2}$ inches. How long is its diameter? ______inches. If d stands for the length of a diameter and r stands for the length of the radius, make a formula to show how to get the length of the diameter if you know the length of the radius. $d = \_\_\_\_ \times r$

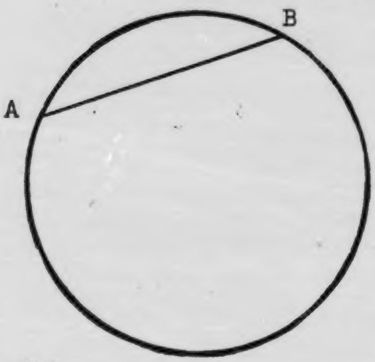
6. Fill in the missing blanks in the following table:

d	r
10	5
12	___
4	___

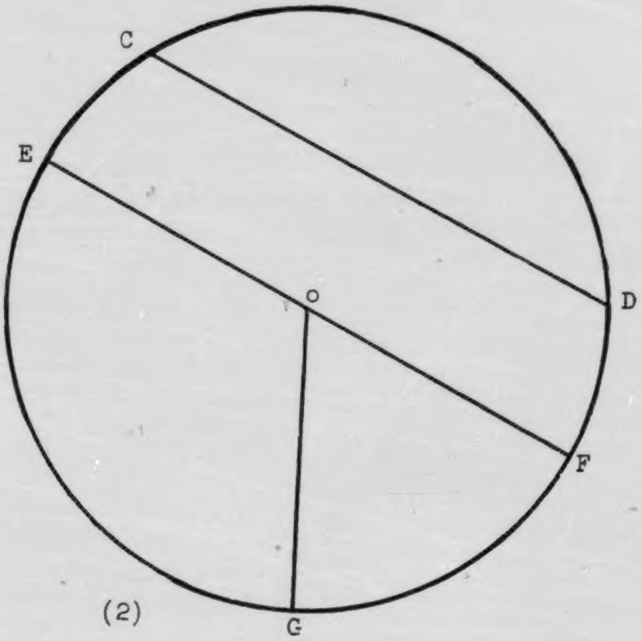
d	r
1	___
___	117.3
$\frac{1}{2}$	___

7. What is the longest chord that can be drawn in a circle? ______________

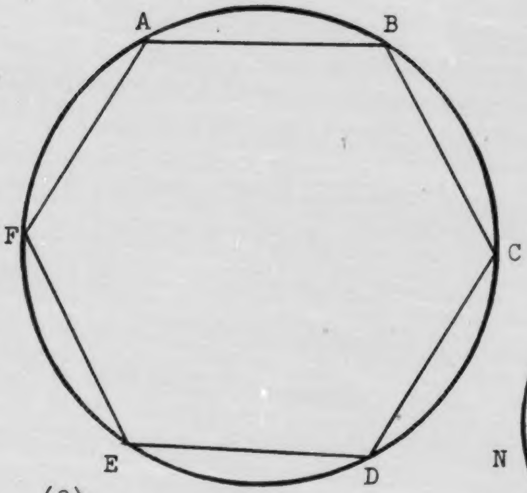
8. Write on the figures below the measurement of each chord rounded to the nearest fourth of an inch.



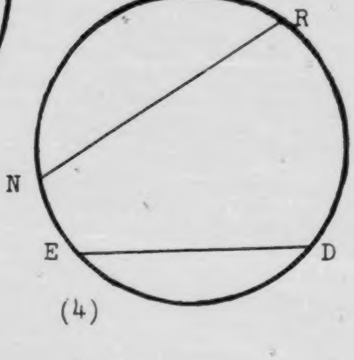
(1)



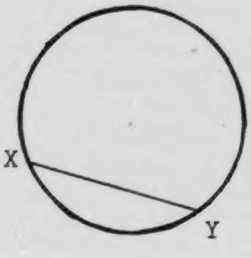
(2)



(3)



(4)



(5)

NAME______________________ DATE______________ SCORE__________ NO. 234

CIRCUMFERENCE AND DIAMETER OF A CIRCLE

A remarkable relation exists between the diameter and the circumference of a circle (the length of the circle). Measure the circumference and diameter of circular objects of different sizes and see if you can discover the relation.

Object	Circumference	Diameter	C - D	C + D	C x D	$\frac{C}{D}$

Do you notice any relation when you subtract the diameter from the circumference? _____ When you add? _____ When you multiply? ____ When you divide? _____

Make up a sentence about the ratio, $\frac{C}{D}$, of any circle's circumference to its diameter: ____

____

Did you say that the ratio is always the same, regardless of the length of the diameter? _____ This ratio is called pi, the name of the Greek letter π.

A decimal expression for π to hundredths is _________.

Expressed in common fraction form π is _________.

We will use $\pi = 3.14$ unless otherwise indicated.

We may express this relation as $\frac{C}{D} = \pi$ or $C = \pi \times$ ______.

Can you find the length of the circumference of a circle if you know that the diameter is 8 feet?

$C = \pi D$

$C =$ ____ x ____

$C =$ ___________

Circumference is ________feet.

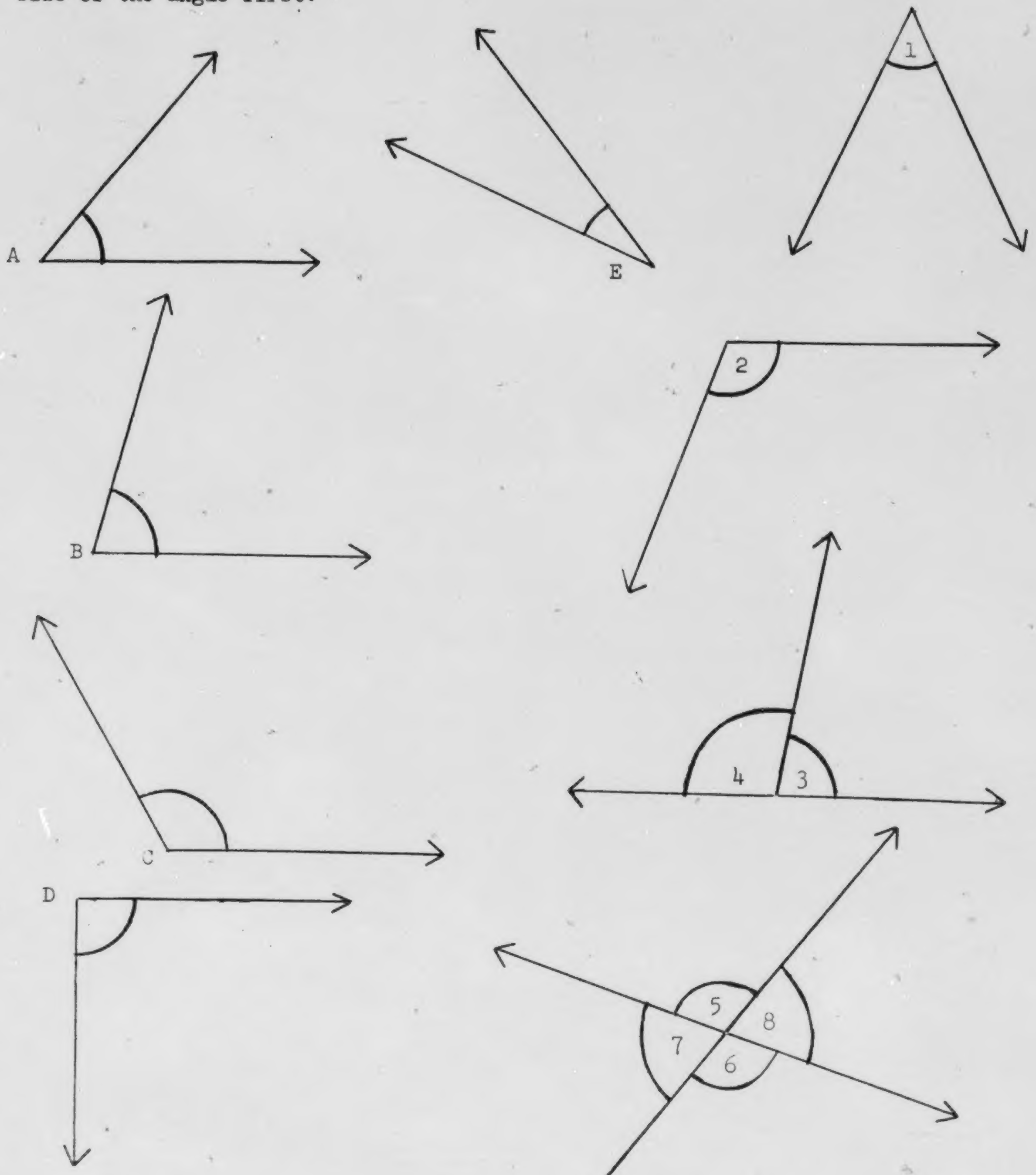
Find the circumference of each circle whose diameter is given below:

1. D = 10 ft. C = _____
2. D = 2.5 in. C = _____
3. D = 5 in. C = _____
4. D = 7 ft. C = _____
5. A ferris wheel at an amusement park has a 40 foot diameter. How far do you ride when the wheel turns once? ___________
6. How many feet of fence will be needed for a circular flower bed which is 14 ft. in diameter? __________ (Use $\pi = 3\frac{1}{7}$)

NAME________________________________ DATE________________ SCORE__________ NO. 235

ANGLE MEASUREMENT

Write within the angle its measure. Be sure when you place your protractor on an angle that (1) the vertex of the angle is at the center of your protractor, (2) that 0° lies on one side of the angle. Estimate the size of the angle first.



NAME ______________________ DATE ____________ SCORE ________ NO. 236

BAR GRAPHS

Information may be given in table form or in a graph. Study the information in the table and complete the bar graph by shading the proper columns to the required height.

AVERAGE LIFE SPAN OF CERTAIN ANIMALS

Animal	Years
Tortoise	150
Man	67
Elephant	60
Chimpanzee	30
Giraffe	28
Tiger	19

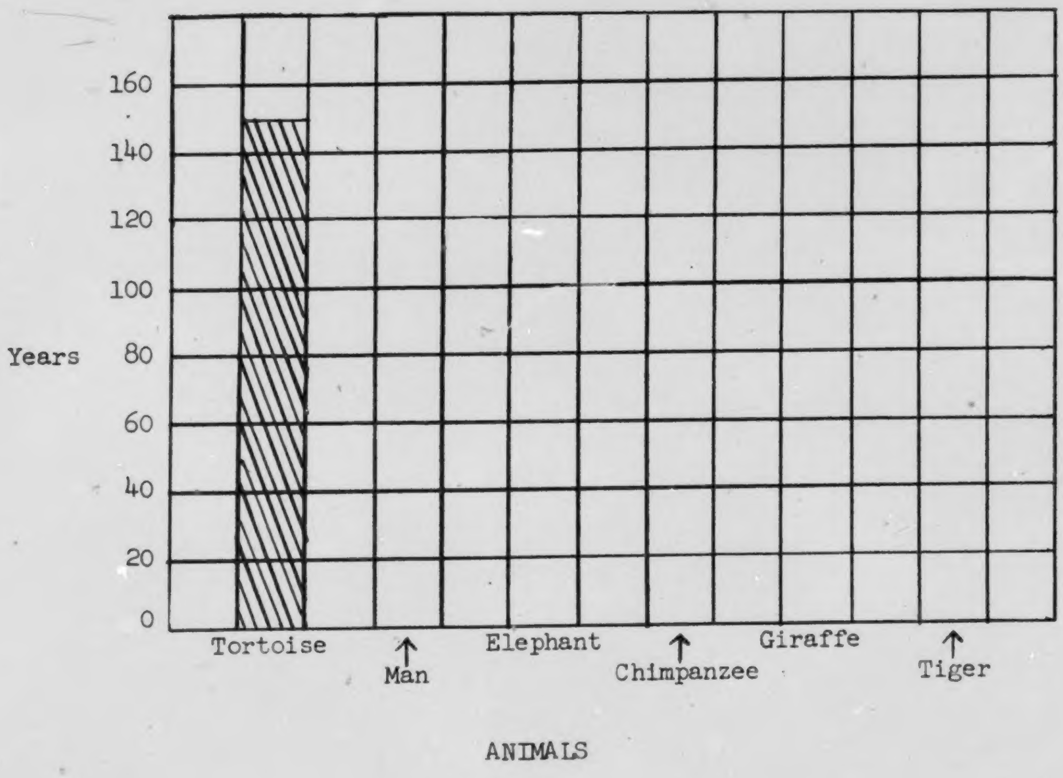
SOURCE: Encyclopedia

1. What is the topic of this information? ______________________

2. What is the source of this information? ______________________

3. In what order are the animals listed? ______________________

4. Where should the top of the bar for Man be located on the graph? ________
Elephant? ________ Chimpanzee? ________
Giraffe? ________ Tiger? ________



5. What do you notice about the size of each space on the vertical scale?

____

6. What is the value of each of the spaces on the vertical scale? ______

____

7. What is the starting point on the vertical scale? ________________

8. Which bar represents the longest average life span? ______________

9. Which lives longer, the chimpanzee or the elephant? ______________

10. What is the ratio of the life span of the chimpanzee to the life span of the elephant? ________________

11. What is the story this graph or table tells? ______________________

____

12. Which tells the story more quickly, the graph or the table? ________

13. Which tells the story more accurately, the graph or the table? ______

____

14. Would you use the table or the graph to find the number of years in the life span of a particular animal? ____________________________

15. Would you use the table or the graph to compare the life spans of the various animals? ________________

STUDY GUIDES SUGGESTED

FOR

NINTH GRADE

LESSON PLAN TO ACCOMPANY 301

BUYING THE FAMILY AUTOMOBILE

Background

This lesson can be taught early in the year, possibly on Friday of the first week of school or on Monday and Tuesday of the next week. This topic and its development fit into Unit I of the standard Ninth Grade General Mathematics Course of Study and should interest ninth grade pupils and supply some motivation for them.

For some groups, the teacher may wish to use this lesson later as part of a unit on transportation or on family budget practices.

Objectives

To develop the pupils' ability to interpret quantitative information supplied in table form and to use it in a problem situation.

To provide motivated practice in computation involving sums of money.

To provide an opportunity for pupils to consider some of the facts related to arriving at the purchase price of an automobile.

Bulletin Board Motivation

Display several newspaper and magazine advertisements for automobiles.

Display samples of price sheets found on the windows of new cars in dealer display rooms and lots.

Suggested Classroom Activities

Review addition involving sums of money.

Discuss with pupils the items to be considered in arriving at the purchase price of an automobile (omitting finance and carrying charges for extended payment plans.)

Discuss with pupils the price sheets noted above.

Suggested Classroom Activities (continued)

Distribute the study guide and discuss the two tables found at the top of the page.

Work out two or more examples allowing pupils to select the model and various groups of accessories.

Have pupils work problems 1-7 on the study guide. When several pupils have finished assign those with correct solutions to work the problems on the board and have them explain their computation.

Discuss the types of computation errors made by pupils in their work on problems 1-7, and the steps pupils should take to prevent repetition of these errors.

Analyze the misunderstandings which caused the errors and re-teach as necessary. Use general discussion and experience of other pupils to help and encourage the slower achievers. If some pupils do not know what addition is or how to add, re-teaching at their level is needed.

Suggested Techniques for Evaluation

Write on the board the name of a car model and a list of selected accessories. Have the pupils compute the total price of the car and submit their work for marking.

Lead the pupils in a discussion of items to be considered in arriving at the purchase price of a new automobile.

Collect the study guide for later marking.

NAME________________________DATE______________SCORE________NO. 301

BUYING THE FAMILY AUTOMOBILE

The cost of an automobile is figured from a list price with the cost of extras (accessories) added. The list price of different models of one car are given in the table.

2 Door	$1780	Custom Deluxe 2 Door	$2750
4 Door	1836	Custom Deluxe 4 Door	2810
Deluxe 2 Door	2190	Custom Convertible	3350
Deluxe 4 Door	2240	Custom Station Wagon	3470

The list price does not include the cost of the following extras.

Heater	$ 86.40	Seat Covers	$22.85
Radio	92.80	Non-Glare Mirror	6.80
Automatic Drive	186.00	Side Mirror	9.70
Undercoat	22.50	Power Brakes	83.20
Back Up Lights	24.20	Power Steering	87.60

To find the total cost of the car he wants, the buyer decides on the list price of the model he selects and adds to this the cost of the extras he wishes.

Find the delivery prices of the cars in the following problems.

1. For his business Mr. Howard wanted the 2 Door with a heater. How much did his car cost? ____________
2. The Waltons chose the Deluxe 4 Door for their family car. If they wanted a heater, radio, undercoat, and seat covers, what was the price of the car? ____________
3. In buying a car for his wife Mr. Johnson selected a convertible with heater, radio, undercoat, power steering, power brakes, and automatic drive. What was the total cost of the car? ____________
4. A scout leader wanted a station wagon with power steering, automatic drive, side mirror, and heater. What did this car cost? __________
5. Mr. Granger purchased a custom deluxe 2 door with heater, radio, automatic drive, seat covers, and back up lights. Find the cost of the car._______
6. For a second car the Martins purchased a 4 door with heater, radio, and automatic drive. Find the cost of the car. ______________
7. Find the cost of the car you would like to buy including the accessories you choose. ____________________

NAME ______________________ DATE ______________ SCORE __________ NO. 302

PRACTICE

Find the missing numbers in these examples:

(1)
$$\begin{array}{r} 6 \\ 4 \\ 9 \\ ? \\ \underline{8} \\ 34 \end{array}$$

(2)
$$\begin{array}{r} 69 \\ \underline{?} \\ 4?3 \end{array}$$

(3)
$$\begin{array}{r} ????? \\ \underline{7231} \\ 4685 \end{array}$$

(4)
$$\begin{array}{r} 9?\ \text{R.}2 \\ ?\overline{)754} \\ \underline{72} \\ 34 \\ \underline{3?} \\ 2 \end{array}$$

(5)
$$\begin{array}{r} 1586 \\ \underline{???} \\ 937 \end{array}$$

(6)
$$\begin{array}{r} 1623 \\ \underline{???} \\ 2549 \end{array}$$

(7)
$$\begin{array}{r} 475 \\ 823 \\ ??? \\ \underline{536} \\ 2038 \end{array}$$

(8)
$$\begin{array}{r} 75 \\ \underline{??} \\ 450 \\ \underline{375} \\ 4200 \end{array}$$

(9)
$$\begin{array}{r} 4?? \\ 8\overline{)?6??} \\ \underline{??} \\ 46 \\ \underline{??} \\ ?4 \\ \underline{??} \end{array}$$

(10)
$$\begin{array}{r} 9?4 \\ 9\overline{)????} \\ \underline{??} \\ 66 \\ \underline{??} \\ ?? \\ \underline{??} \end{array}$$

Assume that the following numbers are added, subtracted, multiplied, or divided in order from left to right. Fill in the missing signs to get the given answer.

Sample: 6 (x) 7 (-) 4 (+) 3 = 41

(11) 8 ? 4 ? 6 = 18

(12) 5 ? 5 ? 5 ? 5 = 0

(13) 8 ? 6 ? 2 = 4

(14) 15 ? 6 ? 2 = 45

(15) 7 ? 5 ? 1 = 36

(16) 28 ? 4 ? 4 ? 2 =

PUZZLES

If 1000 is added to a certain whole number, the result is more than if the number is multiplied by 1000. What is the number? __________

How can four 9's be arranged so that they equal 100? __________

NAME________________ DATE__________ SCORE________ NO. 303

FINDING THE VALUE OF EXPRESSIONS

Replace the letters by the given numerals and write the expression as a single numeral in the following problems.

When two symbols are written together with no sign between, multiplication is expected. For example 3A means 3 x A.

Another way to indicate division is to use the form of a fraction. For example, $\frac{x}{4}$ means $x \div 4$.

Look at an example: A = 4, B = 2

$$\frac{AB - 3}{10} = \frac{4 \times 2 - 3}{10} = \frac{8 - 3}{10} = \frac{5}{10} \text{ or } \frac{1}{2}$$

$t = 10$
$y = 5$
$r = 7$

(1) $2y$ (2) $\frac{10 + t}{y}$ (3) $\frac{r + y}{y}$ (4) $2 + t - 4$ (5) ry

---

$a = 3$
$x = 4$

(6) $\frac{x}{4}$ (7) $a + 6$ (8) $\frac{x}{10}$ (9) $\frac{ax}{10}$ (10) $x - a$

$N = 4$
$D = 5$
$C = 3$

(11) $\frac{N + 2}{3}$ (12) $\frac{D + C}{2}$ (13) NC (14) $D - N$ (15) $C + N$

$P = 3$
$X = 6$
$M = 2$

(16) $\frac{4P + 8X - 3M}{PP}$ (17) $\frac{XX}{MM} + 30 + 9M - XM$ (18) $\frac{4X + MN - 7M}{7}$

$N = 2$
$C = 6$

(19) $\frac{3N + C}{C}$ (20) $NC - N$ (21) $25 + 2N$ (22) $\frac{3}{4}N$

$\ell = 5$
$w = 6$
$h = 7$
$\pi = 3\frac{1}{7}$

(23) ℓwh (24) $\pi\ell$ (25) $2\ell + 2w$ (26) $\frac{\ell}{3}wh$

NAME ________________________ DATE ______________ SCORE __________ NO. 304

MATHEMATICAL SENTENCES - 1

Number Sentences are quite familiar. For example, $7 + 2 = 9$ and $9 + 5 = 12$ are number sentences. Notice that a number sentence may be true or false. Indicate with a T or an F whether each of the following is a true or false number sentence.

_____ 1. $8 + 3 = 11$

_____ 2. $9 + 5 = 14$

_____ 3. $12 - 6 = 7$

_____ 4. $18 + 7 = 6$

_____ 5. $21 - 17 = 41$

_____ 6. $3\frac{1}{2} + \frac{1}{4} = 3\frac{6}{8}$

_____ 7. $2\frac{1}{3} + 3\frac{1}{4} = 5\frac{2}{7}$

_____ 8. $N + 2 = 9$

Why can't you give an answer for Number 8? Sentences like this which contain a variable are called open sentences. Whether they are true or false cannot be determined until a replacement is made for the variable in an open sentence.

In the following find replacements for the variable which will make the sentence true.

_____ 9. $x + 2 = 5$

_____ 10. $x + 9 = 13$

_____ 11. $x + 4 = 9$

_____ 12. $x + 17 = 21$

_____ 13. $x + 2\frac{1}{2} = 5$

_____ 14. $x + 3.4 = 4.1$

_____ 15. $x + 92 = 103$

_____ 16. $x + 27\frac{1}{2} = 32\frac{3}{4}$

_____ 17. $x + 51 = 99$

_____ 18. $x + 13 = 26$

In the following open sentences find replacements for the variable which will make the sentence true.

_____ 19. $x - 3 = 5$

_____ 20. $x - 7 = 3$

_____ 21. $x - 13 = 10$

_____ 22. $x - 2\frac{1}{2} = 2\frac{1}{2}$

_____ 23. $x - 5 = 3$

_____ 24. $x - 17 = 22$

_____ 25. $x - 2\frac{1}{4} = 3\frac{1}{2}$

_____ 26. $x - 5.3 = 6.1$

_____ 27. $x - 4.8 = 9.0$

_____ 28. $x - 131 = 86$

A boy and his dog weigh 138 lbs. together. The dog weighs 24 lbs. Express the weight of the boy and the dog using w for the number of pounds the boy weighs ________________. This is another name for 138 lbs. Write a number sentence using this information. ________________. How much does the boy weigh? ________________

NAME_______________________ DATE_____________ SCORE_________ NO. 305

MATHEMATICAL SENTENCES - 2

You have already learned to work with number sentences involving the operations of addition and subtraction. Now let us examine a different type of number sentence.

I. Indicate whether the sentences are true or false by writing T or F on the blanks:

_____ 1. $7 \times 2 = 14$

_____ 2. $3 \times 5 = 15$

_____ 3. $8 \times 4 = 30$

_____ 4. $(2.3)(1.4) = 32.2$

_____ 5. $12 \times 4 = 48$

_____ 6. $9 \times 6 = 56$

_____ 7. $10 \times q = 30$

_____ 8. $3\frac{1}{2} \times 5 = 19\frac{1}{2}$

Why can't you give an answer to number 7? _______________________

II. Find the replacement for n that will make the sentences true statements.

_____ 1. $7n = 28$

_____ 2. $3n = 12$

_____ 3. $5n = 18$

_____ 4. $\frac{1}{2}n = 20$

_____ 5. $13n = 104$

_____ 6. $2\frac{1}{2}n = 5$

_____ 7. $(.18)n = .90$

_____ 8. $4\frac{1}{4}n = 34$

_____ 9. $23n = 131$

_____ 10. $7\frac{1}{2}n = 5$

III. Find replacements for the variable that will make the following sentences true:

_____ 1. $x + 3 = 8$

_____ 2. $2y = 14$

_____ 3. $m - 11 = 9$

_____ 4. $12s = 48$

_____ 5. $W - 3\frac{1}{2} = 2\frac{1}{4}$

_____ 6. $K + 5.4 = 11.6$

_____ 7. $\frac{2}{3}a = 4$

_____ 8. $9x = 5$

_____ 9. $r + 96 = 800$

_____ 10. $t - 162 = 39$

_____ 11. $\frac{3}{4}z = 7\frac{1}{2}$

_____ 12. $37a = 444$

_____ 13. $\frac{n}{3} = 4$

_____ 14. $\frac{x}{.5} = 2.4$

NAME____________________ DATE__________ SCORE_______ NO. 306

EARNING MONEY

A. Ellen often earned spending money by baby sitting in the afternoons. She was usually paid by the hour. Her hourly pay ranged from \$.45 to \$.90 depending on her duties. Figure how much she should charge for the following jobs.

	Hours Worked	Pay per Hour	Total Pay
1.	4	\$.45	______
2.	3	.75	______
3.	$4\frac{1}{2}$	.45	______
4.	$4\frac{1}{2}$	.50	______
5.	2	.85	______
6.	6	.65	______
7.	$4\frac{1}{2}$	.60	______

B. During the rush season, Frank worked part-time at the neighborhood store. He was paid by the hour. Find how much he earned on each of the following days:

	No. of Hours	Pay per Hour	Total Pay
Monday	3	\$1.05	______
Tuesday	2	1.05	______
Wednesday	$2\frac{1}{2}$	1.05	______
Thursday	4	1.05	______
Friday	6	1.05	______
Saturday	8	1.05	______
TOTAL FOR WEEK	___		________

C. Sally baby-sits every day for her neighbor and is paid once each week. She receives 60¢ an hour. Last week on Monday she sat $1\frac{1}{2}$ hours, Tuesday $\frac{1}{2}$ hour, Wednesday $3\frac{1}{4}$ hours, Thursday 2 hours, Friday $1\frac{1}{2}$ hours, and Saturday 3 hours. What was her pay for the week? ____________

160.

NAME ______________________ DATE ______________ SCORE __________ NO. 307

HOW MUCH DO YOU KNOW ABOUT MATHEMATICS?

Write T or F on the blank at the left of the statement to indicate whether it is true or false. If it is false give an example to show that it is false.

____ 1. The smallest 3-place number is larger than the largest 2-place number. ______________

____ 2. Half of an even number is an even number. ______________

____ 3. An easy way to multiply a whole number by 99 is to multiply by 100 by annexing 2 zeros and then to subtract the number from this result. ______________

____ 4. The length and width of a rectangle are equal. ______________

____ 5. Any two-place number is exactly divisible by 2. ______________

Fill in the numbers which make the following statements true:

6. _____ + 6942 = 10,600

7. 67 x _____ = 24053

8. $\frac{1}{2}$ of _____ = 29

9. $2\frac{3}{8} + 5\frac{1}{4} + 7\frac{1}{2} =$ _____

10. $4\frac{7}{8}$ x _____ = 13

11. 14,621 rounded to the nearest thousand is __________

12. 10.265 - _____ = 4.218

13. 16.12 rounded to the nearest tenth is ________

14. The simplest form of $\frac{12}{100}$ is _____

15. _____% of 426 = 42.6

16. Beside each word write a numeral from the examples below to show that you know what the word means.

a) remainder _____

b) factor _____

c) difference _____

d) product _____

e) quotient _____

f) sum _____

g) divisor _____

h) dividend _____

$$\begin{array}{r}276\\ \underline{145}\\ 421\end{array}\qquad \begin{array}{r}687\\ \underline{296}\\ 391\end{array}\qquad \begin{array}{r}473\\ \underline{7}\\ 3311\end{array}\qquad \begin{array}{r}658 \text{ r } 3\\ 4\overline{)2635}\end{array}$$

17. If the length and width of a rectangle are measured in feet, the product of these numbers will give its area in __________ __________.

PUZZLE: What is the smallest number of boys who can stand so that 2 boys are in front of a boy, 2 boys are behind a boy, and a boy is between 2 boys? ____________

NAME____________________________ DATE______________ SCORE__________ NO. 308

THE QUINARY NUMERATION SYSTEM

In our system of numeration we learned that we group by tens. This system probably happened because man has ten fingers which he used for counting. Suppose our ancestors had only five fingers. How do you suppose they would have grouped things? ______________________ What digits would have been used? ______________________________________.

Let's count in our system (which we call base ten) and in the quinary system (which we call base five). Fill in the missing numerals.

Base Ten	Base Five		Base Ten	Base Five		Base Ten	Base Five		
	fives	ones		fives	ones		twenty-fives	fives	ones
1		1	10	2	0	19			
2		2	11	2	1	20		4	0
3			12			21		4	1
4		4	13			22			
5	1	0	14	2	4	23			
6	1	1	15			24			
7			16	3	1	25	1	0	0
8			17			26	1	0	1
9			18			27			

(1) In 134 in our decimal system, which digit indicates the number of tens? ____________ Which indicates the number of hundreds? __________ Which indicates the number of ones? _______________

(2) In 134_{five} which digit indicates the number of fives? _______ Which indicates the number of ones? _______ Which indicates the number of twenty-fives? ____________

(3) In 2043_{five} which digit indicates the number of fives? ________ Which indicates the number of ones? _________ Which indicates the number of twenty-fives? _________ What does the 2 indicate? ________________

(4) In 243_{seven} which digit indicates the number of sevens? ________ The 2 indicates the number of __________. The 3 indicates the number of __________________.

NAME________________________________ DATE________________ SCORE__________ NO. 309

ADDITION IN THE QUINARY SYSTEM (Base Five System)

In the decimal system the digits 1, 2, 3, 4, 5, 6, 7, 8, 9, 0 are used to write all numerals. Add the following numbers written in base ten numerals.

$$\begin{array}{r}6\\\underline{2}\end{array}\quad\begin{array}{r}6\\\underline{3}\end{array}\quad\begin{array}{r}6\\\underline{4}\end{array}\quad\begin{array}{r}6\\\underline{5}\end{array}$$

As the sum of the two digits increases beyond nine, how is the numeral written? __________ Why? __________

In the quinary system what digits are needed to write all the numerals? _______

Add the following numbers written in base five numerals. 2 + 1 = ____________.

2 + 2 = _______, 2 + 3 = _______. In the quinary system there is no digit that indicates this last sum. The idea of place value and grouping by fives is used. The numeral "10_{five}" means 1 five and 0 ones. 10_{five} is the numeral for the number five.

To write the base five numeral for the number eight, we write 13_{five} which means 1 five and 3 ones. The base five numeral for the number twelve is 22_{five} which means 2 fives and ___ ones. 34_{five} means ____ ____ and ____ ____. 213_{five} means ____ ____ and ____ ____ and ____ ____.

What is the sum of 2_{five} and 4_{five}? __________$_{\text{five}}$.

Complete the following addition table for base five numerals:

+	0	1	2	3	4
0	0	1			
1			3		
2				10	
3					
4		10			13

In 243_{five}, the 2 means 2 x ____________, the 4 means 4 x ____________, and the 3 means 3 x ____________.

All the following examples are written in base five numerals. Perform the indicated operation:

Add:
$$\begin{array}{r}3\\\underline{1}\end{array}\quad\begin{array}{r}2\\\underline{3}\end{array}\quad\begin{array}{r}3\\\underline{3}\end{array}\quad\begin{array}{r}4\\\underline{1}\end{array}\quad\begin{array}{r}10\\\underline{4}\end{array}\quad\begin{array}{r}4\\\underline{3}\end{array}\quad\begin{array}{r}4\\\underline{2}\end{array}\quad\begin{array}{r}4\\\underline{4}\end{array}$$

BRAINBUSTER:

$$\begin{array}{r}34\\\underline{-12}\end{array}\qquad\begin{array}{r}42\\\underline{-13}\end{array}$$

Add:
$$\begin{array}{r}34\\\underline{3}\end{array}\quad\begin{array}{r}13\\\underline{3}\end{array}\quad\begin{array}{r}21\\\underline{2}\end{array}\quad\begin{array}{r}31\\\underline{4}\end{array}\quad\begin{array}{r}11\\\underline{12}\end{array}\quad\begin{array}{r}12\\\underline{31}\end{array}\quad\begin{array}{r}314\\\underline{123}\end{array}\quad\begin{array}{r}23\\\underline{22}\end{array}$$

NAME ______________________________ DATE ______________ SCORE __________ NO. 310

BUYING IN QUANTITIES

More men are buying the family groceries than at any time in the previous history of our country. Why is it important that all young men as well as girls should study how to buy groceries wisely? Some suggestions for getting the most for your money in buying groceries are:

1. Read the labels on canned, boxed or bottled food.
2. Buy in quantities when you can.
3. Watch for sales.
4. Compare prices and buy where you can get the best price for the same brand of goods.
5. Be careful about buying packaged material. Look for uniformity of size of apples, potatoes, etc.

Getting the most for your money -

16 ounces = 1 pound

2 pints = 1 quart

1. How much is saved by buying a pound box of tea for $1.20 instead of buying 8 boxes of 2 ounces each at 19¢ a box? ______________
2. Do you save by buying a pound of butter for 72¢ when you can buy a quarter of a pound of the same butter for 18¢ ? ______________
3. How much is saved by buying a quart bottle of furniture polish for $1.10 instead of a quart in pint bottles at $.69 a bottle? ________
4. How much cheaper is it to buy a large box of cereal (28 oz.) for 25¢ instead of 2 small boxes (14 oz.) for 15¢ a box? ____________
5. Lee can get a 15 oz. box of soap flakes for 30¢ If he uses this brand of soap flakes often, is it better to buy a 30 oz. box for 55¢ ? ______________
6. If the school store sells pencils for 5¢ each or 50¢ a dozen, how much is saved by buying a dozen pencils at a time? ____________
7. Is it always a saving to buy in larger quantities? ____________
____
8. John wanted to buy some twine. He found that he could buy one spool for 25¢ or 2 spools for 40¢. The sales girl said, "You would save 10¢ by buying 2 spools." John laughed and said, "Oh, no, I wouldn't. I would waste 15¢." Explain John's thinking. ______________
____

NAME______________________ DATE______________ SCORE__________ NO. 311

DIVISION OF FRACTIONS

A. Find the products of the following:

(1) $3 \times \frac{1}{3} =$ ______ (2) $\frac{3}{4} \times \frac{4}{3} =$ ______ (3) $2\frac{1}{2} \times \frac{2}{5} =$ ______

(4) $5 \times \frac{1}{5} =$ ______ (5) $\frac{3}{8} \times \frac{8}{3} =$ ______ (6) $3\frac{3}{4} \times \frac{4}{15} =$ ______

What is the product in each case above? _______ Pairs of numbers like these $(3, \frac{1}{3})$; $(\frac{3}{8}, \frac{8}{3})$; $(2\frac{1}{2}, \frac{2}{5})$ are reciprocals. $\frac{9}{5}$ is the reciprocal of $\frac{5}{9}$ and $\frac{5}{9}$ is the reciprocal of $\frac{9}{5}$. What is the product of a number and its reciprocal? ____________

(7) $5 \times 1 =$ _____ (8) $129 \times 1 =$ _____ (9) $\frac{3}{4} \times 1 =$ _____ (10) $\frac{9}{8} \times 1 =$ _____

(11) When a number is multiplied by 1 what is the product? ____________

B. Complete the following:

(12) $\frac{5}{5} =$ _____ (13) $\frac{8}{8} =$ _____ (14) $\frac{12}{12} =$ _____ (15) $\frac{249}{249} =$ _____

(16) What number is named by the fraction that has the same numerator and denominator? ______________

What number is named by $\dfrac{\frac{2}{3}}{\frac{2}{3}}$? _____, $\dfrac{\frac{3}{4}}{\frac{3}{4}}$? _____

C. (17) $\frac{3}{4} \times \frac{5}{5} =$ ______. Are this fraction and $\frac{3}{4}$ names for the same number? ___

(18) Are $12 \div 3$ and $\frac{12}{3}$ names for the same number? ______ Can $5 \div 8$ be written as the fraction $\frac{5}{8}$? _______ Can $\frac{3}{8} \div \frac{5}{16}$ be written as the fraction $\dfrac{\frac{3}{8}}{\frac{5}{16}}$? _______ Can any division problem be written in fraction form? ____________

D. (19) Find the product of $\dfrac{\frac{3}{4}}{\frac{3}{2}} \times \dfrac{\frac{2}{3}}{\frac{2}{3}} =$ _____ Does this name the same number as $\dfrac{\frac{3}{4}}{\frac{3}{2}}$? ______

(20) $\dfrac{\frac{2}{5}}{\frac{3}{7}} \times \dfrac{\frac{7}{3}}{\frac{7}{3}} =$ ______ Does this name the same number as $\frac{2}{5} \div \frac{3}{7}$? ______

(21) To solve $\frac{5}{8} \div \frac{2}{9}$ write the fraction _______ and multiply it by 1 in the form of _________. The problem then becomes _____ x _____ = ______

Perform the indicated operation:-

(22) $\frac{1}{8} \div \frac{1}{4} =$ ______ (23) $\frac{3}{8} \div \frac{3}{16} =$ ______ (24) $\frac{3}{4} \div \frac{5}{8} =$ ______

NAME____________________ DATE__________ SCORE_______ NO. 312

OUR CAR

It is convenient to be able to get into the car and go, isn't it? Let us see, however, what it costs to keep an automobile. Here are a few of the costs:

a. Gasoline
b. Oil
c. Grease
d. Anti-freeze
e. Tires and tubes
f. Repair
g. Insurance
h. License plates
i. Driver's license
j. Garage rent

Another item that many forget is annual depreciation. This is the amount the car loses in value each year. During the first year an automobile generally loses about 35% of the original cost.

Find the depreciation at the end of the first year on a car that cost, when it was new:

1. $2,600 _____
2. $1,900 _____
3. $3,125 _____
4. $4,500 _____

Mr. Brown bought a used automobile for $2,000 and kept a record of his expenses for a year. He traveled 9,000 miles and averaged 15 miles to a gallon of gas. The following are some of the expenses he had:

License plates	$10.00	Anti-freeze - 6 quarts at	.50/qt.
Safety Lane	2.00	Repairs first year	$110.50
Driver's License	1.00	Insurance	84.00
Gasoline	.30/gal.		
Oil and grease every 1000 miles	4.50	Depreciation, 20% of cost	

5. How many gallons of gasoline did Mr. Brown use? ____________

6. What was the total cost of the gasoline? ____________

7. What was the total cost for oil and grease? ____________

8. How much did he pay for anti-freeze? ____________

9. How much did the car depreciate? ____________

10. Find the total cost of running the car for the year. ____________

11. What was the cost per mile? ____________

AUTO SALE
PICKED CAR
Fairlane

A PLANNED PROGRAM OF APPLICATIONS MUST BE PROVIDED

NAME____________________ DATE____________ SCORE________ NO. 313

THE DOWN PAYMENT AND BALANCE OWED WHEN PURCHASING A CAR

Some people who buy cars do not have enough money to pay for the car immediately. Often, used cars may be purchased with $\frac{1}{4}$ the price as a down payment and the balance paid in monthly installments.

Find the down payment and unpaid balance on the following used cars:

			Down Payment	Balance
1.	Plymouth	\$473	\$118.25	\$354.75

$\frac{1}{4} \times 473 = \frac{473}{4} = \$118.25$ $\begin{array}{r} \$473.00 \\ -118.25 \\ \hline \$354.75 \end{array}$

			Down Payment	Balance
2.	Ford	\$479	________	______
3.	Mercury	\$2487	________	______
4.	Chevrolet	\$1346	________	______
5.	Cadillac	\$3294	________	______

6. If the balance of \$354.72 is to be paid in 12 equal monthly installments, how much will each installment be? ____________________

7. If you owe \$1295 on a car and can pay only \$50 per month, how many months will it take to pay for the car? ____________________

8. If you owe \$784.64 on a car and make monthly payments of \$34, how many months will it take to pay for the car? _________________

9. If the balance of \$962.10 is to be paid in 15 equal monthly installments, how much will each installment be? __________________

Round quotients to the nearest cent:

10. $24\overline{)\$816.24}$

11. $6\overline{)\$540.08}$

12. \$1056 ÷ 18

NAME ______________________ DATE ____________ SCORE ________ NO. 314

FOUR WAYS OF EXPRESSING THE TAX RATE

The tax rate may be written in four ways:

1. As a percent . . . . 2.5% on total assessment
2. As a number of dollars and cents on $100 . . . . $2.50 on $100
3. As a number of cents on the dollar . . . . . 2.5 cents on the dollar
4. As a number of mills on the dollar . . . . 25 mills on a dollar

(Note: 1 cent = 10 mills   1 mill = $\frac{1}{10}$ of a cent)

Practice

1. 1 cent = 10 mills
2. 3 cents = _____ mills
3. 4 cents = _____ mills
4. 7 cents = _____ mills
5. 9 cents = _____ mills
6. $2\frac{1}{2}$ cents = _____ mills
7. $3\frac{1}{2}$ cents = _____ mills
8. $\frac{1}{2}$ cent = _____ mills
9. 4.5 cents = _____ mills
10. 5.5 cents = _____ mills
11. .3 cent = _____ mills
12. .7 cent = _____ mills
13. 2.1 cents = _____ mills
14. 7.4 cents = _____ mills
15. 80 mills = _____ cents
16. 60 mills = _____ cents
17. 75 mills = _____ cents
18. 24 mills = _____ cents
19. 2% = _____ dollars on $100
20. $3\frac{1}{2}$% = _____ dollars on $100
21. $1\frac{1}{2}$% = _____ dollars on $100
22. $2\frac{1}{4}$% = _____ dollars on $100
23. $3.00 on $100 = _____ ¢ / dollar
24. $2.50 on $100 = _____ ¢ / dollar
25. What else influences the total tax bill other than the rate of tax? _____

____

26. Who pays more in taxes? A man who owns a lot valued at $2,300 with a 3.2% tax rate or a man who owns a lot valued at $1,500 with a 4.6% tax rate? ______________________________

NAME________________________ DATE____________ SCORE________ NO. 315

PROPERTY TAX

1. The amount of tax an owner must pay on property depends upon two quantities:
   a) The tax value of the property which is called the ________ ________
   b) The tax rate which is given in mills per ________ or ________ per $1000.
   How are the two quantities used in computing the tax? Underline the operation used: addition, subtraction, multiplication, division.
2. In Cincinnati the tax rate is ______________ per $1000.
3. What does a tax rate of $32.16 per $1000 mean? ________________________
   ____
4. How is this used to find the tax on property assessed at $8000? You must find how many _________ in $8000. How many are there? _______ You then find the product of _________ and $32.16. What is the amount of tax on this property? ____________

Find the amount of taxes at the given rates on the following properties:

	RATE	ASSESSED VALUE		AMOUNT OF TAX
5.	$31.75 per $1000	$9000	9000 ÷ 1000 = _____ ___ x 31.75 = _____	__________
6.	$34.24 per $1000	$11,500		__________
7.	$29.78 per $1000	$8,600		__________

8. Using your answer to #2 as a tax rate find the tax on property in Cincinnati assessed at $9400 ______________.
9. Find the property tax on real estate having a value of $4500. The tax rate is $47.50 for each $1000 of value. ___________
10. Find the tax on a lot valued at $2350 if the rate is $25.75 per $1000.
    ____
11. What tax will Mr. Arnold pay on real estate worth $7500 at a rate of $38.56 per $1000? ____________
12. If payments for property taxes are made twice a year, how much does Mr. Arnold owe each time? ____________
13. Find the tax on property assessed at $35,000 if the rate is $2.98 per $100. ______________

NAME________________________________ DATE________________ SCORE__________ NO. 316

FINDING A PERCENT OF A NUMBER

Complete the following by writing in the blank space the numeral which makes the sentence true.

(1) $\frac{2}{3} = \frac{\underline{\quad}}{6}$ (2) $\frac{5}{\underline{\quad}} = \frac{10}{16}$ (3) $\frac{\underline{\quad}}{12} = \frac{18}{24}$ (4) $\frac{3}{4} = \frac{\underline{\quad}}{36}$

(5) $\frac{1}{2} = \frac{\underline{\quad}}{100}$ (6) $\frac{1}{4} = \frac{25}{\underline{\quad}}$ (7) $\frac{3}{5} = \frac{\underline{\quad}}{100}$ (8) $\frac{9}{25} = \frac{\underline{\quad}}{100}$

Write the following as a numeral times a fraction by writing either the numeral or the fraction in the space provided.

(9) $\frac{3}{4} = 3 \times \frac{1}{4}$ (10) $\frac{5}{8} = 5 \times \underline{\qquad}$ (11) $\frac{9}{16} = 9 \times \underline{\qquad}$

(12) $\frac{25}{100} = 25 \times \underline{\qquad}$ (13) $\frac{72}{100} = \underline{\qquad} \times \frac{1}{100}$ (14) $\frac{83}{100} = 83 \times \underline{\qquad}$

The symbol "%" means "$\times \frac{1}{100}$." $36\% = 36 \times \frac{1}{100}$. Complete the following by writing the proper numeral in the space provided.

(15) $78\% = \underline{\qquad} \times \frac{1}{100}$ (16) $43\% = \underline{\qquad} \times \frac{1}{100}$ (17) $52\% = 52 \times \underline{\qquad}$

(18) We see that a percent is the product of a number and ______________.

Study the solution given below for finding 46% of 30.

$$46\% \text{ of } 30 \qquad 46 \times \frac{1}{100} \times 30 = \frac{46 \times 1 \times 30}{100} = 13.80$$

Complete the following exercises.

(20) 32% of 70 $\quad 32 \times \frac{1}{100} \times \underline{\qquad} = \frac{\underline{\quad} \times 1 \times 70}{100} = \underline{\qquad\quad}$

(21) 15% of 254 $\quad \underline{\quad} \times \frac{1}{100} \times \underline{\qquad} = \frac{\underline{\qquad\qquad}}{100} = \underline{\qquad\quad}$

(22) 64% of 128

(23) 36% of a class of 25 are girls. How many girls are in the class? ______

(24) John saves 15% of his salary. Last week he earned $28. How much did he save? __________________

NAME ______________________________ DATE ______________ SCORE __________ NO. 317

FINDING WHAT PERCENT ONE NUMBER IS OF ANOTHER

Complete the following exercises by writing the proper numeral in the blank space.

(1) $\frac{3}{4} = \frac{\quad}{100}$ (2) $\frac{9}{20} = \frac{\quad}{100}$ (3) $\frac{3}{5} = \frac{60}{\quad}$

(4) $\frac{26}{100} = \underline{\qquad} \times \frac{1}{100}$ (5) $\frac{21}{100} = 21 \times \underline{\qquad}$ (6) $19\% = 19 \times \frac{1}{100} = \frac{19}{\quad}$

(7) $32\% = 32 \times \underline{\qquad}$ or $\frac{\quad}{100}$ (8) $48\% = \underline{\qquad} \times \frac{1}{100}$ or $\underline{\qquad}$

(9) $\underline{\qquad}\% = 92 \times \frac{1}{100}$ or $\underline{\qquad}$

(10) There are 9 girls in a class of 25 pupils. Express the ratio of girls to pupils as a fraction. ____________ Change this to a fraction with 100 as the denominator. ________________

(11) $\frac{9}{25} = \frac{\quad}{100}$ The answer is $\underline{\qquad} \times \frac{1}{100} = \underline{\qquad}\%$

(12) $\frac{33}{100} = \underline{\qquad} \times \frac{1}{100}$ or $\underline{\qquad}\%$ (13) $\frac{3}{4} = \frac{\quad}{100}$ or $\underline{\qquad} \times \frac{1}{100}$ or $\underline{\qquad}\%$

A fraction means division. $\frac{9}{12}$ and $12\overline{)9}$ both name the same number.

$\frac{9}{12}$ becomes $\begin{array}{r} .75 \\ 12\overline{)9.00} \end{array}$ $\frac{9}{12} = \begin{cases} .75 = 75 \times \frac{1}{100} \text{ or } 75\% \\ \text{or} \\ .75 = 75 \times .01 \text{ or } 75\% \end{cases}$

Some divisions are not exact. On this paper carry the division to the nearest hundredth.

(13) $\frac{9}{16}$ becomes $\begin{array}{r} . \\ 16\overline{)9.00} \end{array}$ $\frac{9}{16} = \underline{\qquad}$ or $\underline{\qquad} \times .01 = \underline{\qquad}\%$

(14) 32 is _____% of 45

$\frac{32}{45}$ becomes $\begin{array}{r} . \\ 45\overline{)32.00} \end{array}$ $\underline{\qquad} \times .01 = \underline{\qquad}\%$

(15) 62 is _____% of 75.

NAME______________________________ DATE______________ SCORE_________ NO. 318

THE FAMILY BUDGET

Anyone who earns money or who gets an allowance should have a definite plan for using his money. Such a plan is called a budget.

The budget should be based on the amount of money received after deductions have been made. (Take Home Pay)

I. Last month Mr. Brown kept a record of his spending. He spent $150 for food; $90 for shelter; $40 for clothing; $50 for savings; $120 for other expenses. His total income was $450. How much did he spend? _____

What percent of his monthly income was spent for each item?

______% Food
______% Shelter
______% Clothing
______% Savings
______% Other expenses
______% Total percent

Some families set up their own plan while others follow a plan that has been worked out for them.

A suggested plan for spending the family income is to use

23% for Food	15% for Operating Expenses
25% for Shelter	15% for Savings
12% for Clothing	10% for Miscellaneous Expenses

II. The Wallace Family has a yearly take home income of $6,000. Use the suggested budget above to find the amounts to be set aside for each item.

	Percents Budgeted	Yearly amounts Budgeted	Monthly amounts Budgeted
Food	23%		
Shelter	25%		
Clothing	12%		
Operating Expenses	15%		
Savings	15%		
Miscellaneous	10%		
TOTALS			

NAME________________________ DATE____________ SCORE________ NO. 319

INTEREST

Interest may be paid annually (once a year), semi-annually (twice a year or each six months), or quarterly (four times a year or each three months).

Interest is based on a yearly rate. The interest on $100 for one year at the rate of 3% is $3.00.

Notice that the amount of money which earns interest is called the principal.

Tell in your own words how to find the interest for one year on a given amount of money. ________________________________

If John has $350 in his savings account and the bank pays 3% interest, how much interest does John receive in a year?

3% of $350.
$350 principal
.03 rate
$10.50 interest

John receives $10.50 interest. If John deposits the interest how much does he then have in the bank? ________ This is called the amount or balance.

Find the interest on each of the following for one year. In each problem the rate of interest is 3%.

1. $100 ________
2. $200 ________
3. $400 ________
4. $800 ________

As the principal becomes larger, what happens to the interest? ____________

Find the interest on each of the following for one year:

5. $500 at 4% ________
6. $200 at 4% ________
7. $900 at 3% ________
8. $650 at 5% ________
9. $820 at 3% ________
10. $200 at $4\frac{1}{2}$% ________
11. $1000 at 3% ________
12. $400 at $3\frac{1}{2}$% ________

What part of a year is 6 months? ____________ 3 months? ____________

After you find the interest for one year, how will you find it for 6 months? ________________________ for 3 months? ________________________

Find the interest on each of the following:

13. $500 at 4% for 6 months ______
14. $450 at 2% for 6 months ______
15. $200 at 3% for 3 months ______
16. $200 at 4% for 3 months ______

NAME ______________________ DATE ____________ SCORE ________ NO. 320

WATCH YOUR SAVINGS GROW

(Compound Interest)

Banks and Savings and Loan Companies usually pay interest twice a year. They credit this interest to the depositor's account, increasing the amount (balance) in the account. The new balance then earns interest during the next interest period. This interest is called compound interest.

James Bronston deposited $2000 with a Savings and Loan Company on January 1, 1959. The company paid interest at the rate of 4% compounded every half year. Complete this table by finding the interest credited to his account and the new balance on each of the dates below.

DATE	DEPOSIT		INTEREST		BALANCE	
Jan. 1, 1959	2000	00	----		2000	00
June 30, 1959	----		40	00	2040	00
Dec. 31, 1959	----					
June 30, 1960	----					
Dec. 31, 1960	----					
June 30, 1961	----					
Dec. 31, 1961	----					

Beginning in 1958 Mary Martin was given $250 each year as a special gift. Each year she put $200 of it in a Savings and Loan Association on December 31. The Savings and Loan pays interest at a rate of 4% compounded twice a year. Complete the table showing the account of her savings for the 3 years indicated.

DATE	DEPOSIT		INTEREST		BALANCE	
Dec. 31, 1958	200	00	----		200	00
June 30, 1959	----		4	00	204	00
Dec. 31, 1959	200	00				
June 30, 1960	----					
Dec. 31, 1960	200	00				
June 30, 1961	----					
Dec. 31, 1961	200	00				

How much interest in all did the account pay? ____________________

How much money did Mary put into the account? ____________________

NAME______________________________DATE_______________SCORE_________NO. 321

AUTOMOBILE INSURANCE

Many car owners protect themselves from financial loss in case of an accident by purchasing automobile insurance. Liability insurance protects a car owner against loss due to claims of persons his car has injured or whose property his car has damaged.

A standard form of automobile insurance is a $5,000 - $10,000 - $5,000 policy. Under this policy, the insurance company will pay claims up to $5,000 for injuries to an individual, $10,000 for injuries to 2 or more people, and $5,000 for damage to property.

A car which is insured for $5,000 - $10,000 - $5,000 injures two people. Each is awarded claims of $2,400.

1. How much does the insurance company pay? ___________________
2. How much does the car owner pay? ___________________________

A car which is insured for $5,000 - $10,000 - $5,000 injures an individual who is awarded a claim for $6,500.

3. How much does the insurance company pay? __________________
4. How much does the car owner pay? __________________________
5. If the car owner does not have insurance how much does he pay? _____

A $5,000 - $10,000 - $5,000 policy in a certain city costs $48 for the personal liability insurance and $16 for the property damage insurance.

6. What is the total cost of the insurance? __________________
7. What percent of the total cost is the cost of the personal liability insurance? __________________
8. What percent of the total cost is the cost of the property damage insurance? ____________________
9. For 15% more than the yearly premium the amount of insurance can be doubled. Find the cost of a $10,000 - $20,000 - $10,000 policy. _____________________________

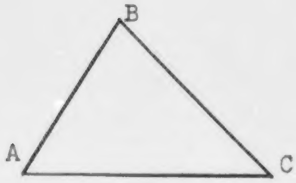
A car may be insured against loss by fire at a cost of 44 cents per $100 value and against loss by theft for 32 cents per $100 value.

10. Find the cost of fire insurance for a car valued at $2400 _________
11. Find the cost of theft insurance for the car in Ex. 10. __________
12. What is the total cost of fire and theft insurance for the car in Ex. 10 and Ex. 11? ___________________

NAME______________________________DATE_______________SCORE__________NO. 322

CLASSIFICATION OF TRIANGLES BY SIDES

(Required: Ruler with $\frac{1}{8}$ inch spaces)



What geometric figure is represented at the left?

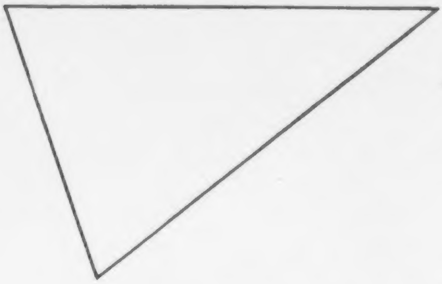
____________ How many sides does it have? ________

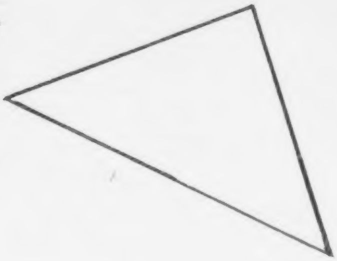
Using two letters for each, name each side. ________

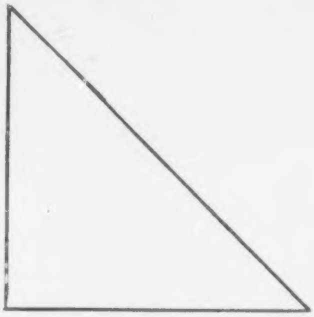
____

Using your ruler, measure the lengths of the sides and write the measure on each. Note that no two of the sides have equal measures. Triangles which have unequal sides are called scalene triangles.

Measure to the nearest $\frac{1}{8}$ inch the sides of the triangles below and write the correct measure on each side.



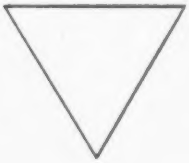


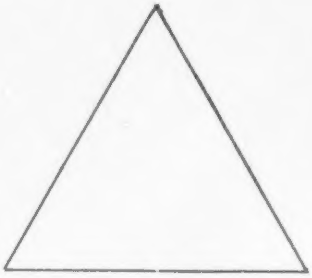


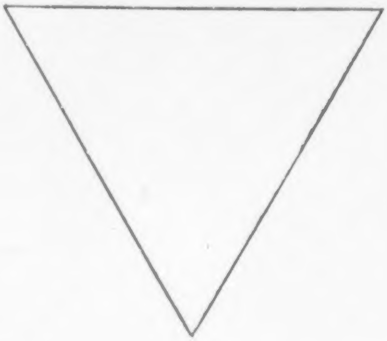
What do these triangles have in common? ______________________________

Triangles like these are isosceles (ī sŏs' c̆e lēz) triangles. Complete the following. An isosceles triangles is a triangle ____________________________.

Measure the sides of the triangles below and write the measure on each side.







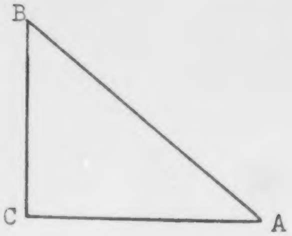
What do these triangles have in common? ______________________________

Triangles like these are equilateral (ē kwĭ lăt' ĕr ăl) triangles.

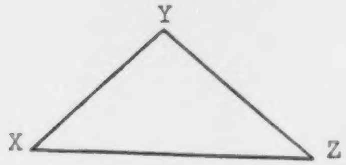
Complete the following. An equilateral triangle is a triangle ____________

NAME______________________________DATE______________SCORE_________NO. 323

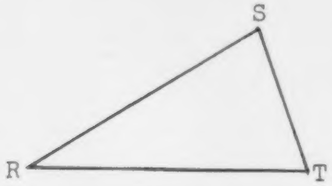
CLASSIFICATION OF TRIANGLES BY ANGLES



A right triangle is a triangle in which one angle is a right angle. Is △ABC (the symbol for triangle is △) a right triangle? ______ If it is, which angle is the right angle?____ Write the measures of the angles on the diagram.

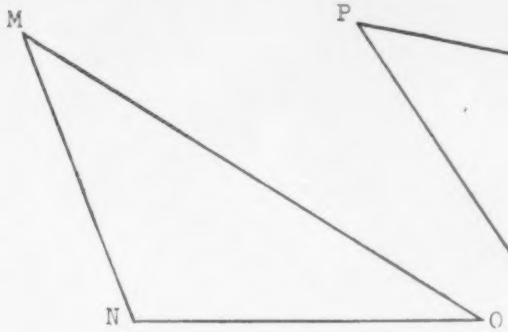


A triangle with an obtuse angle is often called an obtuse triangle. Which angle of △XYZ is the obtuse angle? _______ Write the measures of the angles on the diagram.

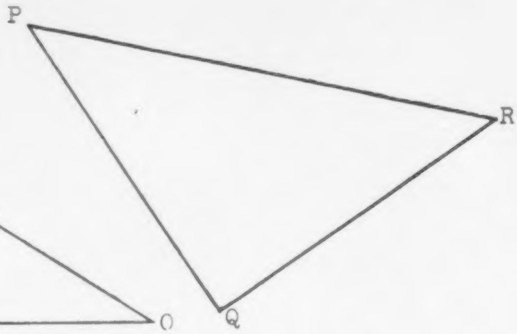


A triangle in which all the angles are acute angles is called an acute triangle. Is △ RST an acute triangle? ______ Write the measures of the angles on the diagram.

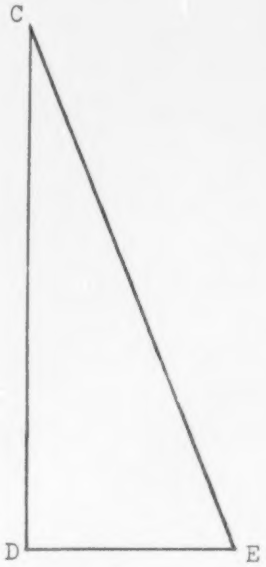
Use your ruler and protractor to identify the following triangles. Write the measures of the sides and angles on the diagrams and classify each triangle first according to sides and then according to angles.



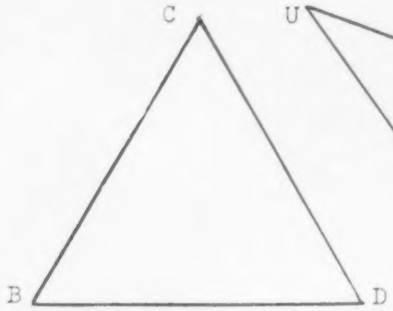
________ ________



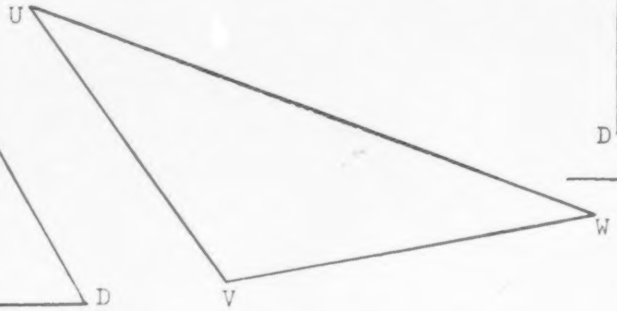
________ ________



________ ________



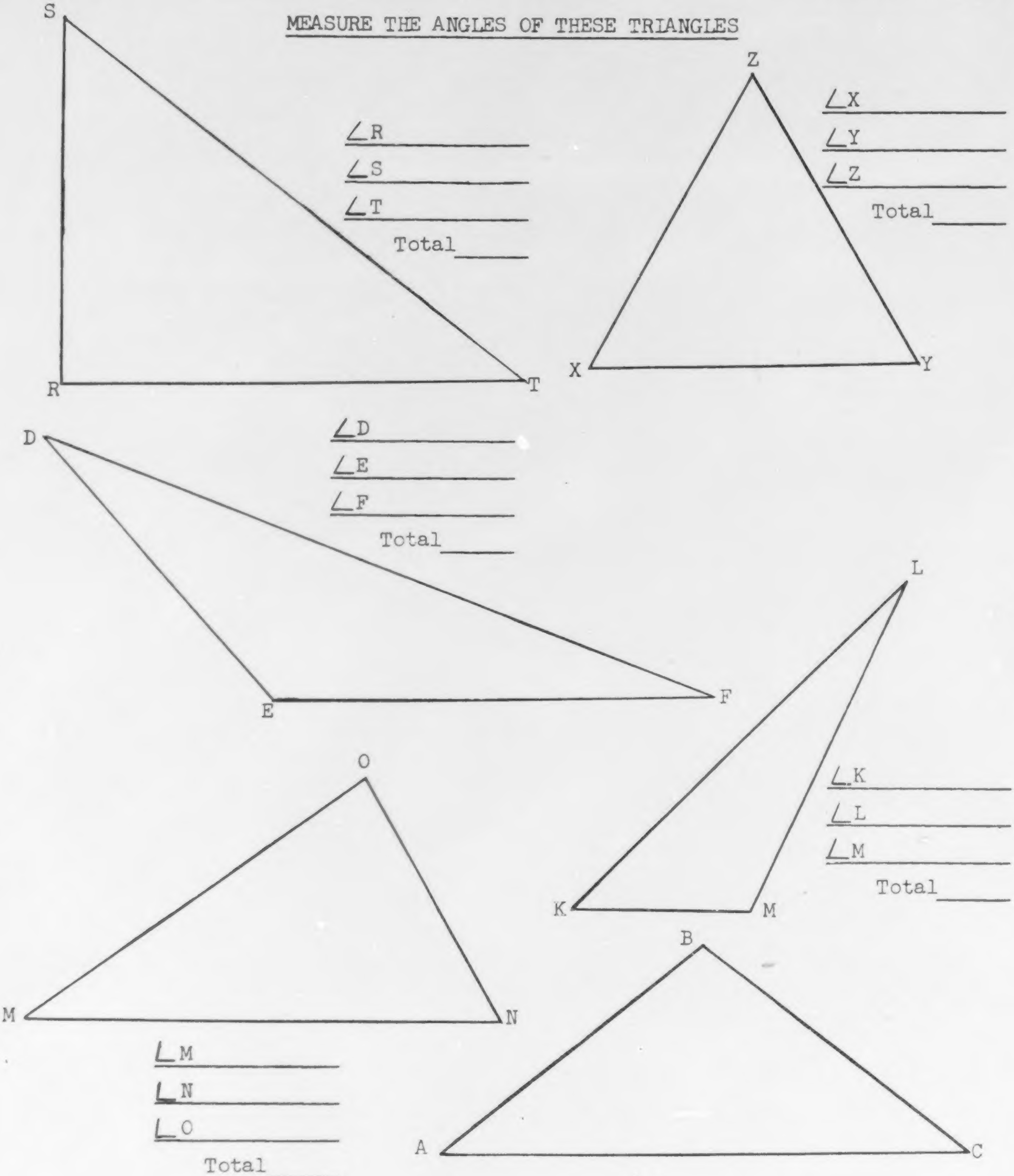
________ ________



________ ________

NAME____________________ DATE____________ SCORE________ NO. 324

MEASURE THE ANGLES OF THESE TRIANGLES


S
R
T
Z
X
Y
D
E
F
L
K
M
O
M
N
B
A
C

∠R __________

∠S __________

∠T __________

Total______

∠X __________

∠Y __________

∠Z __________

Total______

∠D __________

∠E __________

∠F __________

Total______

∠K __________

∠L __________

∠M __________

Total______

∠M __________

∠N __________

∠O __________

Total______

∠A __________

∠B __________

∠C __________

Total______

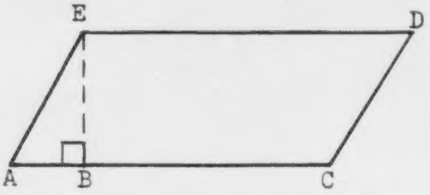
What do you notice about the sum of the angles of a triangle? ______

____

NAME________________________ DATE______________ SCORE__________ NO. 325

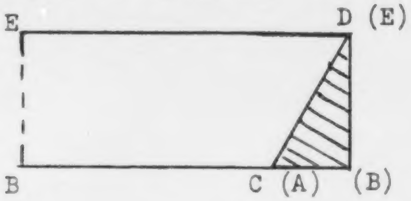
AREA OF A PARALLELOGRAM

(Required: Ruler with $\frac{1}{4}$ inch marks)



In this parallelogram ACDE, the side AC is called the base. If a line from any point on ED is drawn perpendicular to the base, then the length of this line is called the height of the parallelogram. In parallelogram ACDE, the length of EB is the height.

If we pick up triangle ABE and move it to the right hand side of the figure we have a new figure which looks like this.



What is the name of the new figure? __________. Does the rectangle enclose the same amount of area as the parallelogram? ____________________

What is the length of the base of the rectangle? ______ It is the measure of BC + AB.

What is the length of the base of the parallelogram? ________ It is the measure of AB + BC.

Are these two lengths equal? ______ Why? ______________________________

What is the height of the rectangle? _______ of the parallelogram? __________

How do you find the area enclosed by the rectangle? ____________________

How do you find the area enclosed by the parallelogram? ____________________

____

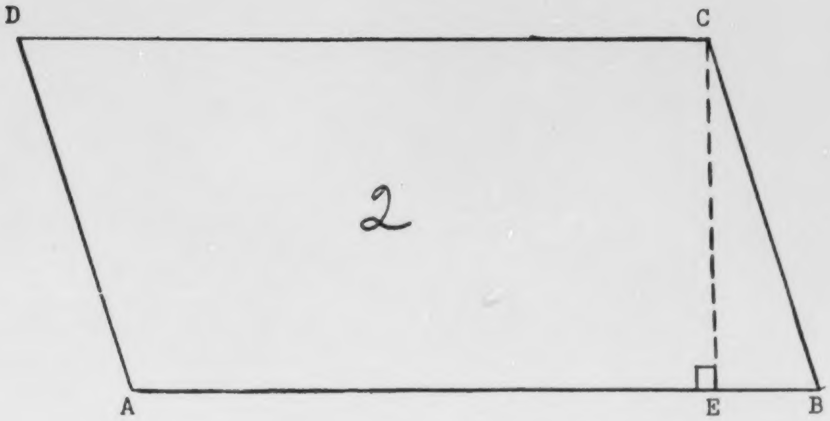
Can you write a formula for the area of the parallelogram? __________________

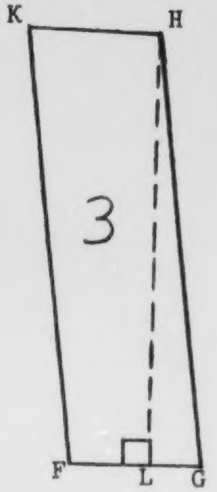
1. What is the area of a parallelogram of base 12 ft. and height 7 ft.? ______

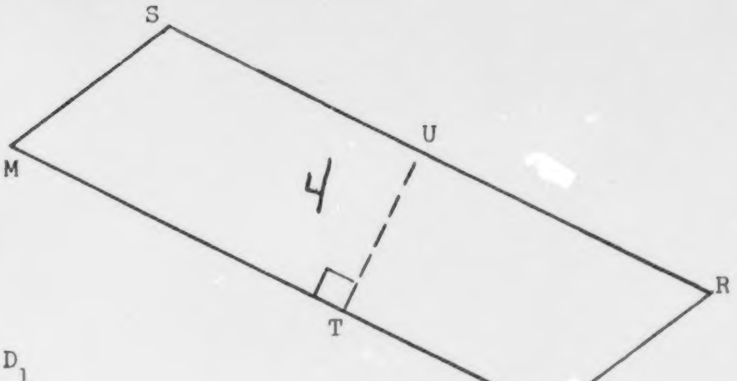
Use figures 2 through 7 on the next page and fill in the table.

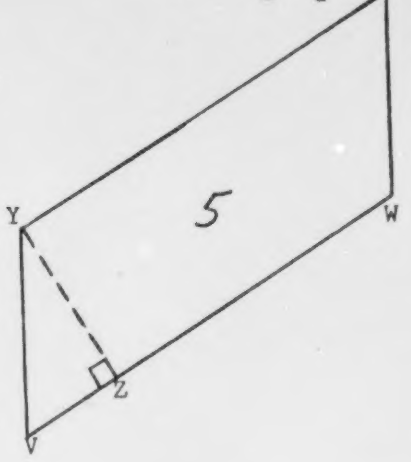
	Name of base	Name of height	Number of inches in base	Number of inches in height	Number of square inches in area
2					
3					
4					
5					
6					
7					

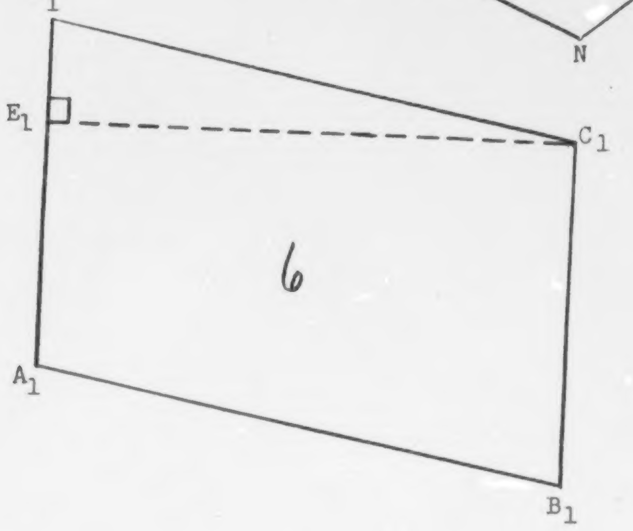
NO. 325 (contd.)

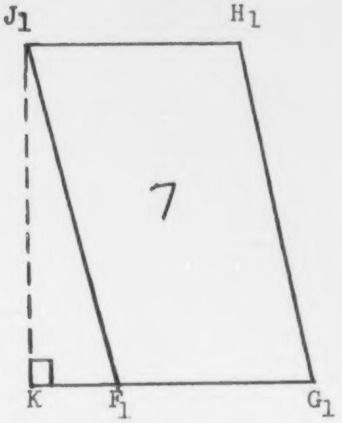









D1
E1
C1
6
A1
B1

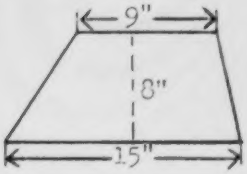

J1
H1
7
K
F1
G1

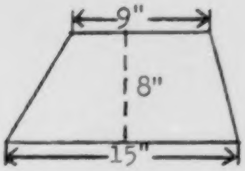
NAME______________________________ DATE______________ SCORE_________ NO. 326

AREA OF A TRAPEZOID

A trapezoid is a four sided figure with only two sides parallel. We call the parallel sides, the bases. Are the bases in a trapezoid the same length?

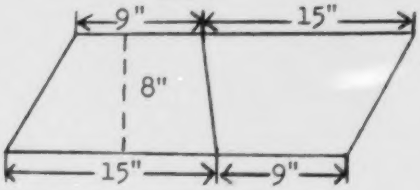
____





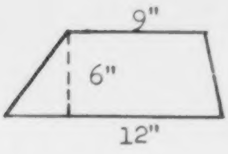
The line which is perpendicular to the two bases is called the height.

The trapezoids above are the same size. Cut them out and place them together as shown below. What is the figure you form when you place the two trapezoids together? ______________What is the length of its base?___________



What is its height? ________ What is its area? _______What is the area of one of the trapezoids? _________ Try to write a general formula for finding the area of the combined figures. __________________Now try to write a general formula for finding the area of a trapezoid.____________________________

Example: Find the area of the trapezoid shown:



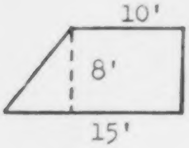
$A = \frac{1}{2}(b_1 + b_2)\ h$

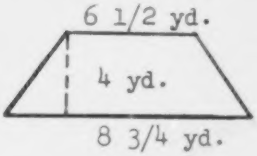
$A = \frac{1}{2}(12 + 9)\ 6$ The area is

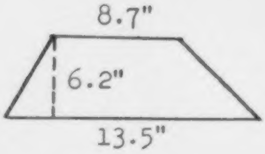
$A = \frac{1}{2} \times 21 \times 6$ ________sq. in.

$A =$ _________

Find the area of each trapezoid below.

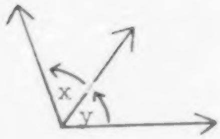


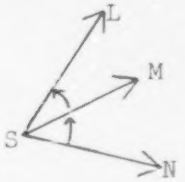


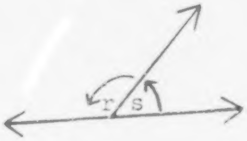


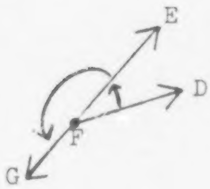
NAME______________________________ DATE______________ SCORE_________ NO. 327

ADJACENT ANGLES

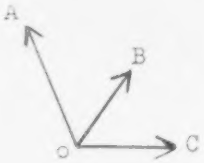








Pairs of angles like these are adjacent angles. They have a common vertex, a common side between them, and their interiors have no points in common.



1. In the figure at the right, are the angles adjacent?______
2. Name the adjacent angles. ____________ and______________
3. Name the point which is the common vertex. ______________
4. Name the common side. __________________________________

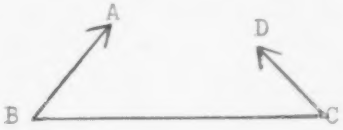


Figure I

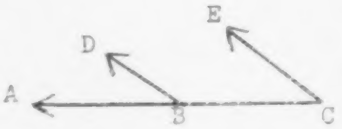


Figure II

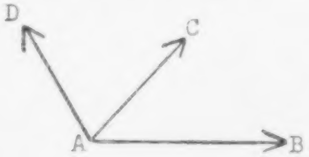
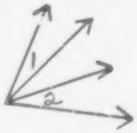
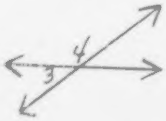


Figure III

5. In Figure I there are two angles. Name them.__________________________
   Name the common side. ____________ Name the common vertex. ____________
   Are the two angles adjacent? ______________
6. Are ∠ ABD and ∠ ACE in Figure II adjacent angles? ______________________
   Name the common side.____________ Name the common vertex. ____________
7. Are ∠ ABD and ∠ DBC in Figure II adjacent angles?______________________
   Name the common side.____________ Name the common vertex. ____________
8. Are ∠ DAC and ∠ BAC in Figure III adjacent angles? ____________________
   Name the common side.____________ Name the common vertex. ____________



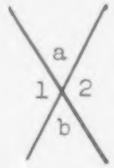
9. Are ∠ 1 and ∠ 2 at the right adjacent angles? _______
   Explain ____



10. Are ∠ 3 and ∠ 4 at the right adjacent angles? _______
    Explain ____

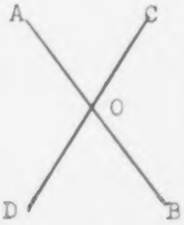
NAME______________________________ DATE_______________ SCORE_________ NO. 328

VERTICAL ANGLES



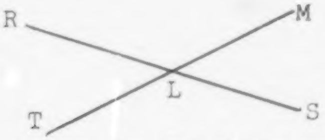
In the figure at the right ∠a and ∠b are vertical angles and ∠1 and ∠2 are vertical angles.

The nonadjacent angles formed by the intersection of two straight lines are vertical angles.



1. Name two pairs of vertical angles in the figure at the right. _______________ and ________________
   _______________ and ________________

2. The common vertex is the point named with the letter _____.

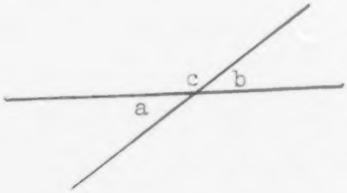


3. Which angle at the left forms a pair of vertical angles with ∠RLM?______

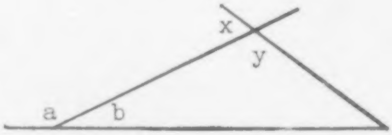
4. With angle MLS? __________

5. Are ∠TLR and ∠RLM vertical angles? _____ Explain _____________________

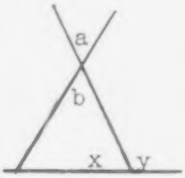
Of the angles which are named in each figure, tell which pairs are adjacent angles and which pairs are vertical angles.



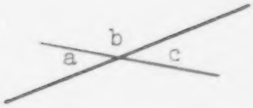
6. ∠a and ∠b ______
7. ∠a and ∠c ______



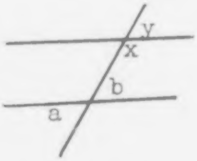
8. ∠ a and ∠ b ______
9. ∠ x and ∠ y ______



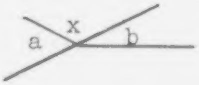
10. ∠ a and ∠ b ______
11 ∠ x and ∠ y ______



12. ∠a and ∠b ______
13. ∠a and ∠c ______



14. ∠a and ∠ b ______
15. ∠x and ∠ y ______



16. ∠a and ∠x ______
17. ∠b and ∠x ______
18. ∠a and ∠b ______

NAME______________________________ DATE_________________ SCORE__________ NO. 329

COMPLEMENTARY ANGLES

(required: protractor)

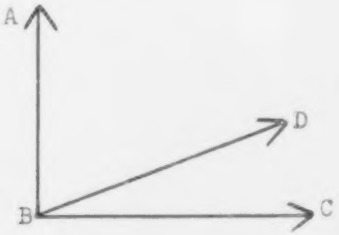
Pairs of angles whose sum is 90° are called complementary angles.

If ∠ A = 40° and ∠ B = 50° then ∠ A and ∠ B are complementary. What is the measure of the angle which is complementary to each of the following angles?

1. 48° 42°
2. 24° _____
3. 15° _____
4. 75° _____
5. 63° _____
6. $38\frac{1}{2}^\circ$ _____
7. 42.6° _____
8. 24.7° _____
9. $82\frac{1}{2}^\circ$ _____

Indicate which of the following pairs of angles are complementary by writing "C" in the blank. Write "NO" if the angles are not complementary.

10. 23°, 67° _____
11. 35°, 45° _____
12. 87°, 13° _____
13. 58°, 22° _____
14. $40\frac{1}{2}^\circ$, $49\frac{1}{2}^\circ$ _____
15. $12\frac{1}{2}^\circ$, $72\frac{1}{2}^\circ$ _____



An angle of 90° is a right angle. ∠ ABC at the left is a right angle.

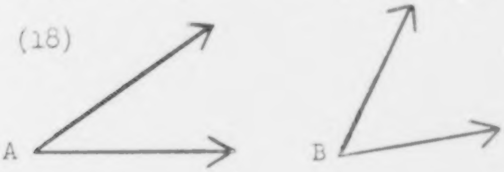
(16) Are ∠'s ABD and ∠ DBC at the left complementary?____________________

(17) What other word may be used to describe the relation between these two angles?

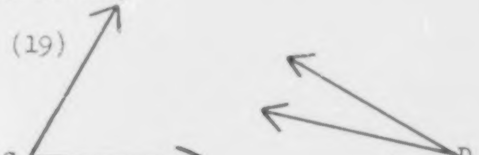
____

Use your protractor to measure the following pairs of angles. Write complementary on those pairs which are complementary.

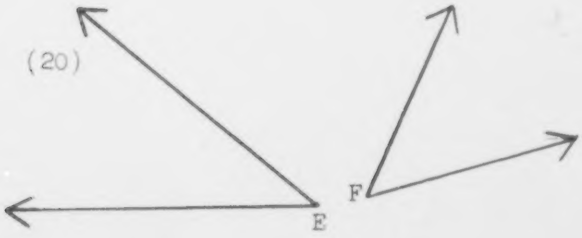
(18)



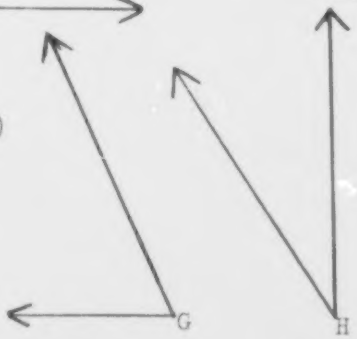
(19)



(20)



(21)



NAME________________________ DATE______________ SCORE__________ NO. 330

SUPPLEMENTARY ANGLES

Find the sum of the measures of the following pairs of angles.

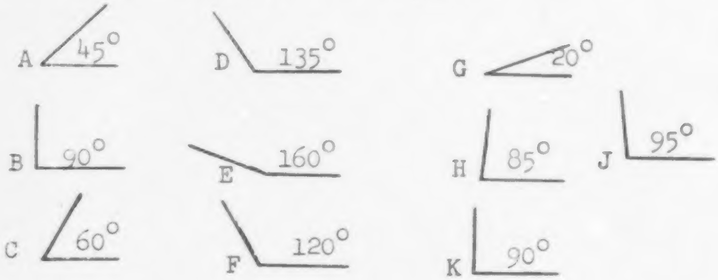
(1) A and D ________

(2) E and G ________

(3) H and J ________

(4) C and F ________

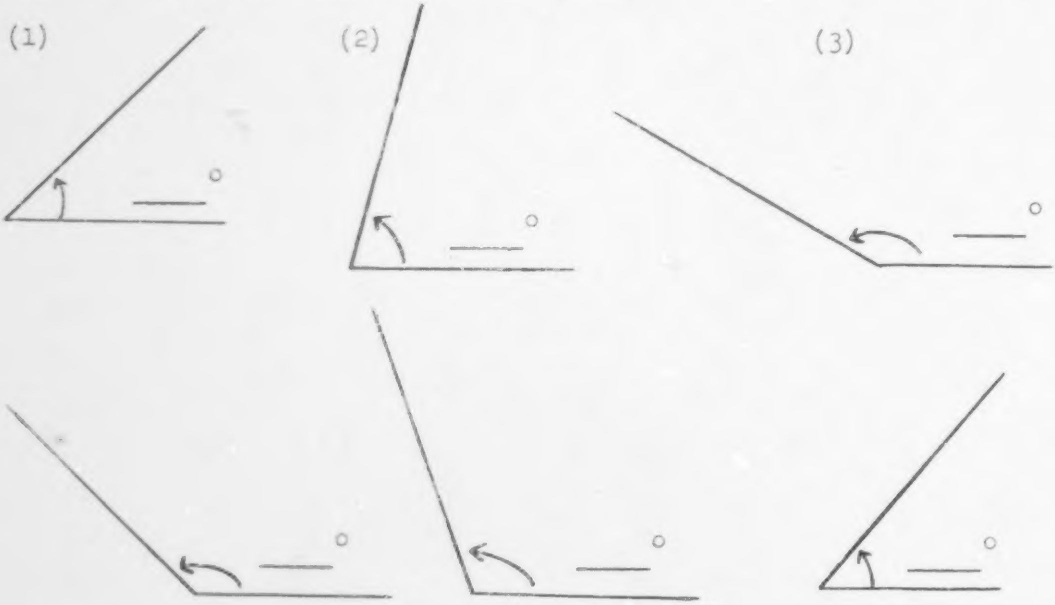
(5) B and K ________



Pairs of angles like these are called supplementary angles. Complete the following statement: Supplementary angles are two angles whose ________

____

Measure the following pairs of angles with your protractor. Write the size of each angle on the blank. If a pair of angles is supplementary write supplementary in the blank beneath the pair.



____________ ____________ ____________

In each case below, give the measure of the angle needed to make a pair of supplementary angles.

(1) $\angle 68^\circ$ and $\angle$ ________°

(2) $\angle 117^\circ$ and $\angle$ ________°

(3) $\angle 103^\circ$ and $\angle$ ________°

(4) $\angle 24\frac{1}{2}^\circ$ and $\angle$ ________°

(5) $\angle 129^\circ$ and $\angle$ ________°

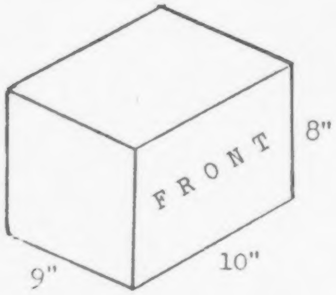
(6) $\angle 165^\circ$ and $\angle$ ________°

(7) $\angle 83\frac{1}{3}^\circ$ and $\angle$ ________°

(8) $\angle 171^\circ$ and $\angle$ ________°

NAME__________________________ DATE______________ SCORE_________ NO. 331

SURFACE AREA OF A BOX



The diagram at the left pictures a box 10 in. long, 9 in. wide and 8 in. deep.

1. What kind of figure is represented by the front of this box?__________ What are its dimensions?____________ Find the area of the front of the box.____________ Is there another part of the box just like the front?____________________

2. What kind of figure is represented by the side of this box? ________What are its dimensions? ___________Find the area of the side of the box.____ Is there another part of the box just like the side? ______________

3. What kind of figure is represented by the top of the box?_________ What are its dimensions? ____________Find the area of the top of the box. ___ ________ Is there another part of the box like the top? ______________

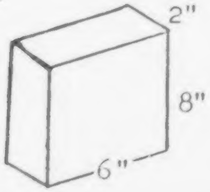
4. To find the total area of the surface of a box, what three areas must be found? ________________________________

   What is done to each of these areas?____________________________

   How is the total area found? ____________________________

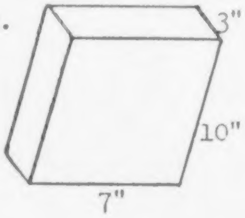
Find the total surface area of the boxes with dimensions as shown.

1.



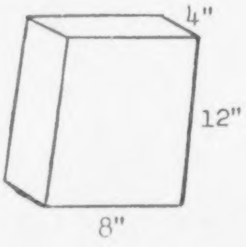
Front and back _____
Both sides _____
Top and bottom _____
Surface area _____

2.



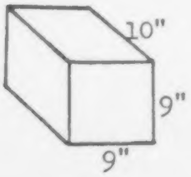
Front and back _____
Both sides _____
Top and bottom _____
Surface area _____

3.



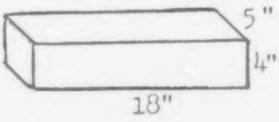
Front and back _____
Both sides _____
Top and bottom _____
Surface area _____

4.



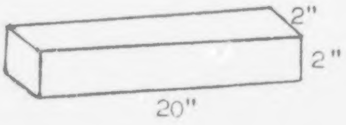
____

5.



____

6.



____

NAME______________________________ DATE_______________ SCORE__________ NO. 332

POWERS OF NUMBERS

5 to the third power is 5 x 5 x 5 or 125. We write 5^3 to indicate 5 to the third power. The 3 above and to the right of the 5 is an exponent and indicates the number of times 5 (the base) is used as a factor. 6 to the second power is 6^2 or 6 x 6 or 36.

Raise the following to the indicated power:

3^2 = 3 x 3 or 9

2^3 = ___ x ___ x ___ or ____

(1) 4^4 = ____________
(2) 7^3 = ____________
(3) 5^2 = ____________
(4) 9^2 = ____________
(5) 1^5 = ____________

(6) 1^2 = ____________
(7) 8^2 = ____________
(8) 2^5 = ____________
(9) 3^3 = ____________
(10) 12^2 = ____________

(11) 0^3 = ____________
(12) 10^1 = ____________
(13) 10^2 = ____________
(14) 10^3 = ____________
(15) 10^5 = ____________

Write the following with exponents:

(16) 3 x 3 x 3 = __________
(17) 8 x 8 x 8 x 8 = ________
(18) 4 x 4 x 4 = __________
(19) 9 x 9 x 9 x 9 x 9 = ________
(20) 15 x 15 x 15 x 15 = ________
(21) 6 x 6 x 6 = _________
(22) 10 to the 7th power _________

(23) 16 = $4^?$ _______
(24) Write 16 as a power of 2. _______
(25) Write 27 as a power of 3. _______
(26) Write 1000 as a power of 10 ______
(27) Write 1,000,000 as a power of 10. ______________
(28) $10^2 \times 10^3$ = ___________
(29) $5^3 \times 5$ = ___________

(30) Does $15^2 + 20^2 = 25^2$? YES_______ NO______
(31) Express 7 x 7 x 7 x 7 in a shorter way. _____________
(32) What is $\frac{8^3}{8^2}$? ____________
(33) If a square measures 4" on one side, what is its area? ________________
Write its area using an exponent. _____________________________________

NAME__________________ DATE__________ SCORE________ NO. 333

ESTIMATING SQUARE ROOTS

The square root of a number is one of its two equal factors. The square root of 25 is 5, of 81 is 9. What are the square roots of the following?

(1) 100 ______
(2) 36 ______
(3) 4 ______
(4) 1 ______
(5) 64 ______
(6) 144 ______
(7) 49 ______
(8) 25 ______
(9) 9 ______
(10) 81 ______
(11) 16 ______
(12) 121 ______

We have a symbol for square root which looks like this: $\sqrt{\ }$ For example: $\sqrt{25} = 5$, $\sqrt{81} = 9$.

Numbers such as 20, 72, and 75 have square roots which are not whole numbers but approximations for them can easily be found.

Find $\sqrt{20}$

$\sqrt{25} = 5$
$\sqrt{20} = ?$
$\sqrt{16} = 4$

$\sqrt{20}$ is about half way between $\sqrt{16}$ and $\sqrt{25}$. Try 4.5

4.5 x 4.5 = ______. What shall you try next? ____

___ x ___ = ______

Which is closer to $\sqrt{20}$? _____ $\sqrt{20}$ is approximately ________.

Find $\sqrt{72}$

$\sqrt{81} = 9$
$\sqrt{72} = ?$
$\sqrt{64} = 8$

$\sqrt{72}$ is between _____ and ______.

8.5 x 8.5 = ______. What shall you try next? ____

___ x ___ = ______

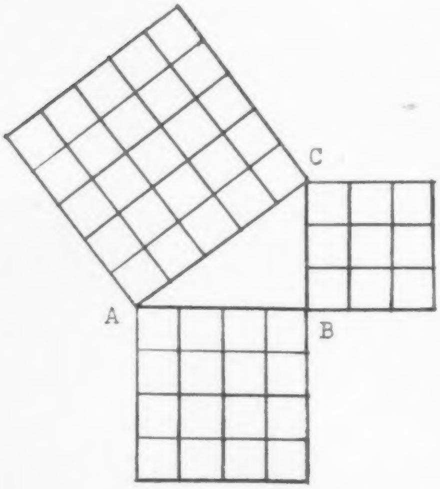
Which is closer to $\sqrt{72}$? _______ $\sqrt{72}$ is approximately _________.

Find approximate square roots of:

(1) $\sqrt{40}$ _____
(2) $\sqrt{12}$ _____
(3) $\sqrt{90}$ _____
(4) $\sqrt{55}$ _____
(5) $\sqrt{110}$ _____
(6) $\sqrt{2}$ _____
(7) $\sqrt{32}$ _____
(8) $\sqrt{116}$ _____
(9) $\sqrt{43}$ _____
(10) $\sqrt{191}$ _____
(11) $\sqrt{3}$ _____
(12) $\sqrt{8}$ _____
(13) $\sqrt{10}$ _____
(14) $\sqrt{80}$ _____
(15) $\sqrt{75}$ _____

NAME____________________________ DATE______________ SCORE_________ NO. 334

THE PYTHAGOREAN THEOREM



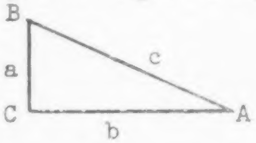
The drawing at the left shows a right triangle △ABC. Squares have been drawn on the 3 sides of the triangle.

1. What is the area of the square on side CB? ________________
2. What is the area of the square on side AB? ________________
3. What is the area of the square on side AC? ________________
4. Write a number sentence showing the relation among the numbers 9, 16, and 25. ____________________________ ____________________________.

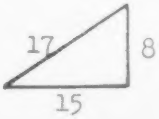
A long time ago this relationship was noticed. Credit is given to a Greek mathematician, Pythagoras, for proving that it is true for every right triangle.

"The square of the hypotenuse of a right triangle is equal to the sum of the squares of the sides."

$$a^2 + b^2 = c^2$$

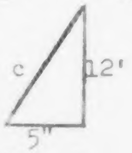


5. Which angle of the above triangle is the right angle? ____________
6. Which line segment is the hypotenuse? ______________
7. Which line segments are called sides? ______________
8. Apply the formula to the triangle with measurements as shown in the drawing.________________
9. Show how to use the formula to find 17 given 15 and 8. ____
10. Show how to use the formula to find 8 given 17 and 15.____



Use the relationship $a^2 + b^2 = c^2$ to find the length of the missing side in each right triangle below:

(11)



$a^2 + b^2 = c^2$

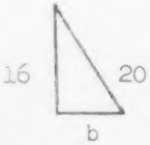
$5^2 + 12^2 = c^2$

___ + ___ $= c^2$

________ $= c^2$

c = ___

(12)



$a^2 + b^2 = c^2$

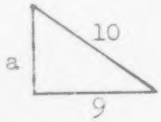
$16^2 + b^2 = 20^2$

___ $+ b^2 =$ ___

$b^2 =$ ___

b = ___

(13)



$a^2 +$ ___ = _____

A MULTI–SENSORY APPROACH TO LEARNING IS DESIRABLE IN THIS PROGRAM

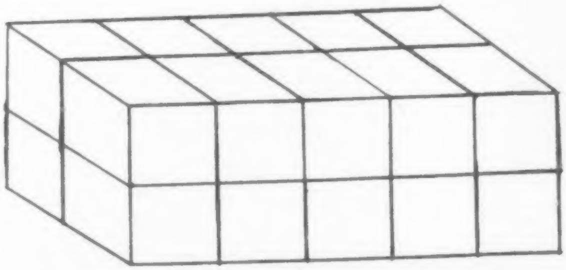
NAME________________________ DATE______________ SCORE__________ NO. 335

VOLUME

A solid is a figure having 3 dimensions. The 3 dimensions are often called ____________, __________, and ___________. Label them in the figure below.

The volume of a solid is the amount of space it encloses. The usual choice for a unit of volume is a _____________.

Consider this figure:



How many units are in the length? ______________

How many units are in the width? ______________

How many cubic units are in the top layer? _________________

How many layers like the top layer are in the entire figure? _____________

Then the volume (total number of cubic units in the figure) is _____________.

Can you find the total number of cubic units without counting them? ___________. What is the way? _________________________ Can you write this as a mathematical statement? ________________

$$V = l \times w \times h$$

$$V = \_\_ \times \_\_ \times \_\_$$

V = ____________ The volume is _____ cubic units.

Find the volume of the following rectangular solids:

	length	width	height	Volume
1.	8 in.	4 in.	3 in.	______
2.	4.5 ft.	5 ft.	6 ft.	______
3.	1 ft.	$\frac{1}{2}$ ft.	$\frac{1}{3}$ ft.	______
4.	$3\frac{1}{2}$ ft.	$4\frac{1}{2}$ ft.	6 ft.	______
5.	2 ft.	1.7 ft.	1.3 ft.	______
6.	3 meters	5 meters	8 meters	______
7.	$\frac{1}{4}$ yd.	$\frac{1}{3}$ yd.	$\frac{1}{2}$ yd.	______
8.	18"	6"	$\frac{1}{2}$ "	______

NAME ______________________ DATE ____________ SCORE ________ NO. 336

OPPOSITE NUMBERS

Write answers for the following:

1. You lose 3 pounds one week and 2 pounds the next. What is the total change in weight? ____________
2. You gain 7 pounds one month and lose 5 pounds the next. What is the net change in weight? ____________
3. You walk 3 blocks east and then 4 more blocks east. How many blocks away from where you started are you? ______ In what direction? ____
4. You go up 6 floors in an elevator and then go down 2 floors. How many floors above where you started are you? __________
5. You earned $3 and then spent $2. If you had no money when you started, how much do you now have? __________
6. A football team gains 5 yards on the first play and loses 3 yards on the second play. In the two plays has the team gained or lost? __________ How many yards? __________
7. You count 8 units to the right of 0 on a number scale and then 3 units to the left. On what number point do you stop? ________
8. You owe $7 on a debt and pay $3. How much do you still owe? ______
9. You had no money to start with, save $5 one week, $4 the second week, and then spend $3. How much do you then have? __________
10. The temperature goes up 4 degrees in one hour, up 3 more degrees in the second hour, then goes down 5 degrees in the third hour. What is the net change in the temperature? ____________
11. A person walks 3 blocks east, then turns and walks 5 blocks west. Is he east or west of where he started? ________ How many blocks away from where he started is he? ____________
12. An elevator operator goes up 4 floors and then down 7 floors. How many floors away from where he started is he now? ______ Is he above or below where he started? __________

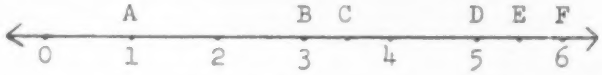
Indicate the net change in the following:

13. Up 4, down 3 up 1
14. Down 9, up 7 ______
15. Up 5, up 3 ______
16. To the right 6, to the left 8, ______
17. East 5, west 9 ______
18. Gain 15, lose 8 ______
19. Increase 105, decrease 200 ______
20. Lose 10, win 5 ______

NAME ______________________________ DATE ______________ SCORE _________ NO. 337

THE NUMBER LINE AND NEGATIVE NUMBERS

A. A number line is formed by making an orderly association of numbers with points equally spaced on a line as shown in the figure below.



What number is associated with the points labeled on the number line?

1. A ____ 2. B ____ 3. C ____ 4. D ____ 5. E ____

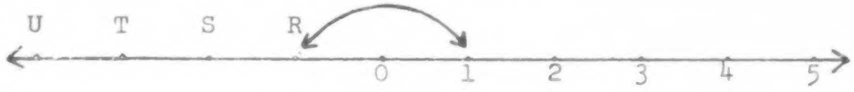
6. Are there points to the right of point F? ________

7. Are there numbers greater than the number 6? ________

8. Extend the number line shown above to show the next two equally spaced points and the next two whole numbers. What are the numbers associated with these points? ______ ______

9. Can a number line be extended to the right? ________
Are there more numbers to associate with these points? ________
The numbers on this side of 0 are called positive numbers and are written as +1, +2, +3, ... or 1, 2, 3, ...

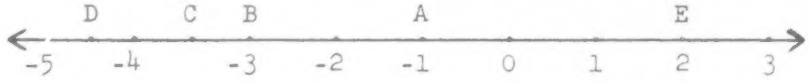
B. Geometry teaches that lines extend in either direction.



In the diagram, the point labeled R is shown to be opposite the point associated with 1. With what letter is the point labeled which is opposite the point associated with 2? _____ with 3? _____ with 4? _____

Mathematicians associate numbers with the points on the left of 0. With point R they associate the number -1 (negative one). With point S they associate -2 (negative two). What number would be associated with point T? _____ With point U? _____ With the point opposite 5? _____
With the point opposite $3\frac{1}{2}$? ______

C.



1. On the number line above what number is associated with the point labeled

A? _____, B? _____, C? _____, D? _____, E? _____

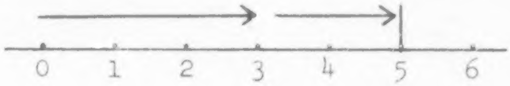
NAME ______________________ DATE ____________ SCORE ________ NO. 338

ADDITION ON THE NUMBER LINE

1. A man walks 3 blocks east and then 2 more blocks east. How far is he from where he started? ________ In what direction is he? ________
2. A man walks 3 blocks east and then 4 blocks west. How far is he from where he started? __________ In what direction is he? ________

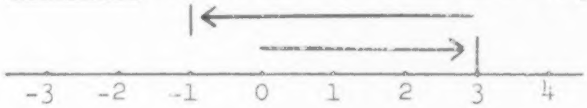
Consider a positive number (+8) to mean a movement to the right on the number line.

3. To show the sum of +3 and +2, start at 0 and draw an arrow to show +3. Then start at 3 and show an arrow +2 units long. On what number point did you stop? _______ What is the sum of +3 and +2? _________



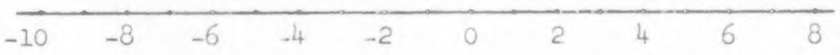
Consider a negative number (-8) to mean a movement to the left on the number line.

4. To show the sum of +3 and -4, start at 0, draw an arrow to show +3, start at 3 and draw an arrow to the left to indicate -4. On what number point did you stop? _______ What is the sum of +3 and -4? ________



Draw arrows to show the following additions on the number line. Indicate the name of the number point on which your arrows stop.

5. +5, +2 _____


-10
-8
-6
-4
-2
0
2
4
6
8

6. +5, -3 _____

-10
-8
-6
-4
-2
0
2
4
6
8

7. -3, -2 _____

-10
-8
-6
-4
-2
0
2
4
6
8

8. -2, +4 _____

-10
-8
-6
-4
-2
0
2
4
6
8

9. +3, -3 _____

-10
-8
-6
-4
-2
0
2
4
6
8

10. -3, +3 _____

-10
-8
-6
-4
-2
0
2
4
6
8

11. +2, -5 _____

-10
-8
-6
-4
-2
0
2
4
6
8

12. +6, -4 _____

-10
-8
-6
-4
-2
0
2
4
6
8

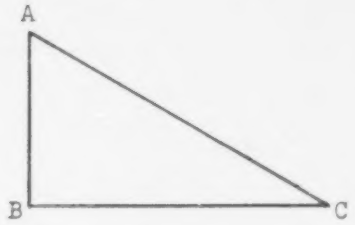
13. +5, -8 _____

-10
-8
-6
-4
-2
0
2
4
6
8

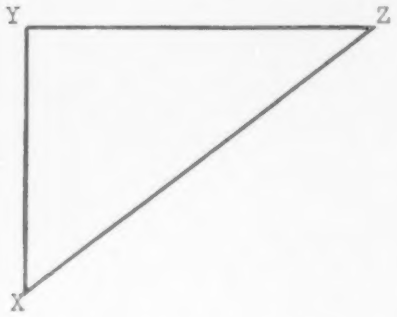
NAME__________________________ DATE______________ SCORE_________ NO. 339

A MEDIAN DRAWN TO THE HYPOTENUSE OF A RIGHT TRIANGLE

(required: Ruler with $\frac{1}{8}$ inch marks)

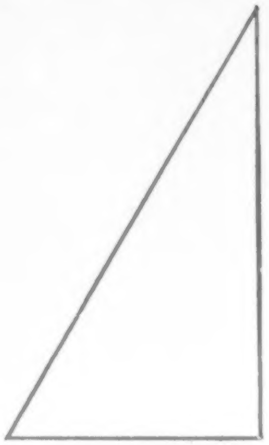


1. Triangle ABC is a right triangle. Name its hypotenuse. __________
2. What is the measure of its hypotenuse? __________
3. Find the midpoint of AC and label it P. Draw PB. (A line from a vertex to the midpoint of the opposite side of a triangle is called a median.) What is the measure of this median? __________



4. △XYZ at the left is a __________ triangle.
5. What is the measure of its hypotenuse? __________
6. Find the midpoint of its hypotenuse and draw the median to the hypotenuse. What is the measure of this median? __________
7. Draw the median to the hypotenuse of the right triangle at the right.
8. What is the measure of its hypotenuse? __________
9. What is the measure of its median? __________
10. Compare the measure of the median to the hypotenuse with the measure of the hypotenuse in each triangle and draw a conclusion concerning their relationship in right triangles. __________________________

    Draw five right triangles on the back of this page with medians drawn to the hypotenuse. Measure the hypotenuse and the median in each case. Does your conclusion hold? __________



Resource units which may suggest projects and
activities of special interest to pupils
in the Modified General Program of Instruction

Seventh Grade - Buying Lunch
Eighth Grade - Pupils' Ages
Ninth Grade - Measurement

These units represent planning for longer blocks of time. They will require from several days to several weeks for completion.

BUYING LUNCH

Seventh Grade Resource Unit

Skills and Concepts	Activities
	- Pupils new to junior high school need to learn how to budget money to secure adequate lunches. In social studies, teachers emphasize appropriate behavior during the noon period. In science, pupils study the importance of selecting balanced lunches, to include starch, protein, and minerals as well as the proper number of calories. - All these units help to orient the pupil to the new experience of choosing his lunch in a school cafeteria from a variety of foods at different prices.
Learning to read	- On the next page is a food price list which will provide material for problems. - Include practice in finding the amount spent for lunch by each member of the class. Mimeographed pages like the following may be useful. Later the class may try to add these amounts orally.

Addition of whole numbers

Name	Fish and Meat	Sausages	Vegetables	Soup	Sandwiches	Salads	Desserts	Ice Cream	Beverages	Juices	
Joe	20¢		8¢	8¢					3¢		39¢
Mary					12¢	10¢		10¢			32¢
Jim		12¢		8¢			9¢		6¢		35¢
Etc.											
Total	20¢	12¢	8¢	16¢	12¢	10¢	9¢	10¢	9¢		$1.06

Oral addition

FOOD PRICE LIST FOR SECONDARY SCHOOL LUNCHROOMS

15¢ ITEMS

- Baked Hash
- Bean Casserole
- Cheese Strata
- Cod Fish Cake
- Country Sausage
- Creamed Hamburger
- Hamburger Whip
- Hamburger and Potatoes
- John Marsetti
- Meat Roll
- Pinwheels and Gravy
- Salmon Balls
- Spaghetti Meat

FISH AND MEAT ITEMS
20¢ ITEMS

- Beef Stew
- Chicken and Noodles
- Chili
- Chow Mein
- Creamed Tuna on Toast
- Fish
- Ham Load
- Meat Loaf
- Mock Veal
- Porcupine Balls
- Turkey a la King
- Turkey and Noodles

25¢ ITEMS

- Baby Beef Liver
- Baked Ham
- Creamed Beef on Toast
- Creamed Ham on Toast
- Creamed Turkey on Toast
- Cube Steak
- Ham and Egg Scallop
- Pork Chops
- Pork Steak
- Roast Beef
- Roast Lamb
- Roast Pork
- Roast Veal
- Turkey and Dressing
- Veal Chops

SAUSAGES - 12¢

- Bratwurst
- Frankfurter
- Hamilton Met
- Pork Links

ENTREES

Baked Beans	10¢
Dressing and Gravy	10¢
Noodles, Buttered	10¢
Rice, Buttered	10¢
Spaghetti and Tomatoes	10¢
Spanish Rice	10¢
Crackers and Cheese	10¢
Macaroni and Cheese	10¢

VEGETABLES - 8¢

All Vegetables

SOUPS - 8¢

All Soups

SANDWICHES

Bread Sandwiches	12¢
Grilled Cheese	12¢
Quick Beef Grill	12¢
Wiener on Bun	12¢
Barbecue on Bun	15¢
Coney Island	15¢
Fish, Fried	15¢
Hamburger on Bun	15¢
Roast Beef and Gravy	25¢

BREADS

Plain White - per slice	1¢
Rye - per slice	1¢
Poppy Vienna - 2 slices	3¢
Crackers (4) per cello. pkg.	2¢
Rolls, each	5¢
Doughnuts	5¢

SALADS

Egg, Fish or Meat	12¢
All Other Salads	10¢

BUTTER - 2¢

Pat

DESSERTS

Baked Apple	9¢
Cake, Slices, Wedges or Squares	9¢
Cobbler Custard	9¢
Fruit, Saucer	9¢
Puddings	9¢

Cake, Layer - Wedges	11¢
Compotes	11¢
Pie, Cream, Fruit, or Chiffon	11¢

ICE CREAM

Brick	8¢
Novelties	6¢ and 10¢

BEVERAGES

Coffee, Black	7¢
Coffee with Cream	7¢
Tea 5¢ - Extra Cream	2¢

JUICES - 6¢

All Juices (5 oz)

Milk - White and Chocolate (1/2 Pint)	Pupils - 3¢	Adults - 8¢
Milk - White and Chocolate (1 Pint)	Pupils - 6¢	Adults - 18¢
Buttermilk (1/2 Pint)	Pupils - 8¢	Adults - 8¢

Skills and Concepts	Activities
	- Obtain a calorie table and ask the pupils to find the approximate number of calories in each lunch.
Making Change	- If Joe's lunch is 40¢ and he hands the cashier $1.00, the cashier checks the change by adding to 40¢ selected coins until he reaches $1.00. Joe should subtract 40¢ from $1.00 to be sure the change is correct. Mimeographed material as follows might well be used several times during the year. See Study Guide 124.

Subtraction of Whole numbers

			CHANGE					
Name	Money Given	Money Spent	Pennies	Nickels	Dimes	Quarters	Halves	Total Change
Joe	$1	40¢			1		1	60¢
Mary	50¢	26¢	4		2			24¢
Jim	45¢	37¢	3	1				8¢

Make change with as few coins as possible.

Skills and Concepts	Activities
Division	- Encourage the pupil to find how much he can spend each day for lunch with his allowance.
Liquid Measure	- Compute with the class the quarts of milk consumed by the class each day at lunch.

Skills and Concepts	Activities
Time Measure Subtracting Denominate Numbers	- Review reading the clock for lunch dismissal and for getting back to class. Subtract the dismissal time from the returning time. Find amount of time spent in school. Discuss meaning of A.M. and P.M.
Reading the Calendar	- Review the meaning of A and B weeks and see if the pupils can find the week and day on the calendar. Note that all months do not contain the same number of days. Look up the history of the calendar.
Making Graphs	- Help the pupils make a bar graph showing the total money spent in the lunchroom for a week.
Addition and Division with Money (average)	- Teach the class to find the average amount of money spent in the lunchroom each day.
Multiplication of Mixed Numbers and Fractions Division of Denominate Numbers	- The lunchroom manager may talk to the pupils about how she decides upon the quantity of food to buy. She may discuss the cost of equipment (cups or forks) and services. Then the class may make up and work problems on buying in quantity, altering recipes, cost of broken dishes, and the speed with which the lines must move to get everyone served within the lunch period.

PUPILS' AGES - EIGHTH GRADE

Skills and Concepts	Activities
Denominate Numbers	Since certain forms need information about the ages of pupils, it is helpful to have each pupil compute his age in years, months, and days.

Teach pupils how to write dates in numerical form as September 15, 1962 = 9/15/62

Provide practice in writing dates. Use birth dates of pupils.

Show that this may be changed for convenience in computing so that the largest unit (year) is on the left: 62/9/15 (year, month, day).

Give practice in writing dates in computation form.

Discuss the operation used to find the difference between 2 numbers; between 2 dates.

Example: Find the time between June 3, 1947 and September 15, 1962.

September 15, 1962	62/9/15
June 3, 1947	47/6/ 3
	15/3/12

*15 years, 3 months, 12 days

Ask pupils how to proceed if the top number is smaller than the bottom number in the "day" column.

September 1, 1962	62/9/1
June 3, 1947	47/6/3

Use 30 days for one month and discuss "changing" with the pupils.

62/8/31
47/6/ 3
15/2/28

*15 years, 2 months, 28 days

Skills and Concepts — Activities

Denominate Numbers

(Contd.)

Continue with an example which requires changing in the "month" column.

September 15, 1962
November 8, 1946

$$\begin{array}{r} 62/\ 9/15 \\ \underline{46/11/\ 8} \end{array}$$

$$\begin{array}{r} 61/21/15 \\ \underline{46/11/\ 8} \\ 15/10/\ 7 \end{array}$$

*15 years, 10 months, 7 days

Lead up to cases like the following:

September 1, 1962
October 7, 1947

$$\begin{array}{r} 62/\ 9/\ 1 \\ \underline{47/10/\ 7} \end{array}$$

$$\begin{array}{r} 62/\ 8/31 \\ \underline{47/10/\ 7} \end{array}$$

$$\begin{array}{r} 61/20/31 \\ \underline{47/10/\ 7} \\ 14/10/24 \end{array}$$

*14 years, 10 months, 24 days

For pupils who find 3 columns difficult, use just year and month columns.

September, 1962
June, 1947

$$\begin{array}{r} 62/\ 9 \\ \underline{47/\ 6} \\ 15/\ 3 \end{array}$$

*15 years, 3 months

September, 1962
November, 1947

$$\begin{array}{r} 62/\ 9 \\ 47/11 \end{array} \qquad \begin{array}{r} 61/21 \\ \underline{47/11} \\ 14/10 \end{array}$$

*14 years, 10 months

MEASUREMENT - NINTH GRADE

Skills and Concepts	Activities
History	- Circulate, read, and discuss literature about history of measurement. - Have better pupils give special reports on early measuring attempts. Bureau of Standards - Read to pupils from reference books. - Project film strips: #6941 - History of Linear Measure #6942 - History of Weights and Measures #6944 - History of Our Number System #6945 - History of Our Calendar #6946 - History of Telling Time
Importance	- Have pupils collect newspaper and magazine articles about measurement. Post these on bulletin board; project with an opaque projector; use in notebook. - Discuss use of measurements by pupils during summer (home, playground, work). - Discuss use of measurements by families and friends of pupils in earning a living. - Demonstrate as many measuring tools as possible.
Linear Measure	- Make a list of, and bring to class a variety of measuring instruments of all kinds, as steel tape, pedometer, foot rule, cyclometer. - Requisition, mimeograph, or make on cardboard, rulers; starting with 1 inch marks. Later make 1/2 inch, 1/4 inch, 1/8 inch marks. - Measure some common objects to a greater degree of precision each time. Have pupils do this, too. - Provide practice using yardstick, 6-foot rule, 100 foot steel tape, cloth tape. - Provide practice in measuring, such as length and width of school building, school room, auditorium, chalkboard, door, desk, window, library cases, books.

Skills and Concepts	Activities
Linear Measure (Contd.)	- Draw lines on board; or mimeograph some on paper. Have estimates made, then measure as accurately as possible. - Make use of an enlarged section of a ruler drawn at board so that pupils may point out fractional parts. - Have pupils draw lines of set length up to 1/8 inch accuracy; check with partner. - Project film: #1173 - The Steel Rule #6265 - Measurement #6333 - Measuring Accurately
Liquid Measure	- Make a collection of wet and dry measure containers. List things sold by dry measure at a market. - Make a complete collection of liquid containers; let pupils use water to discover equivalents. Show quart containers of different shapes. - Have collection of labels made to show different ways of showing capacity. - Offer problems in "Arithmetic in the Kitchen." - Discuss formulas for "baby bottles."
Weight	- If possible secure a set of scales that will measure ounces as well as pounds. Weigh a pound of bulky material (feathers); compact material (beans); very compact material (metal). - Make a list and secure pictures of things sold by ounce; by pound; by ton. - Estimate weight of some items; of pupils; weigh them to see who came closest.

Skills and Concepts	Activities
Weight (Contd.)	- Collect some labels showing units of weight. - Project film #1937 - Weights and Measures.
Temperature	- Have different thermometers brought to class; learn how to read them; meaning of below 0°; importance of 32°, 212°, 98.6°, etc. - Experiment with readings taken outside, in sun, in shade, inside; higher, lower positions in room. Record temperatures on board. Note how much of a rise, fall, etc.
Surface Measure	- Discuss which units will be most suitable. - Show relationship of basic units, using tokio paper, blackboard, blocks, etc. - Use applications, as laying of tile, linoleum blocks, sound-proofing squares. - Discuss various uses of square measure around the home (rugs, linoleum, painting surfaces). - Show difference between 2 sq. ft. and 2 ft. sq. - Develop formula: $A = lw$, $A = s^2$, (use flannel board and "square inches" cut from construction paper.) - Project film strip #6943 - History of Area Measure.
Volume	- Help pupil recognize solids, such as cubes, rectangular prisms, spheres, cylinders, and cones. - Bring out the idea that these solids all have an additional dimension, that of thickness. - Show why the cube is the best unit to measure volume. - Build a rectangular solid from cubes. Help pupils generalize how to compute the cubic units in the first layer and then multiply this product by the number of layers to obtain the volume. (Use set of geometric solids made at Central High School.)

Skills and Concepts	Activities
Volume (Contd.)	- First work problems in which the three dimensions are all expressed in the same unit. - If the class can do more difficult work, give the pupils volumes in which the dimensions are not all expressed in the same unit. - Help the pupils derive $V = s^3$ from $V = lwh$ in the case of a cube. - Help the class generalize that the Volume of any solid is the area of its base multiplied by its height. Develop here the volume of a cylinder.
Angles and Direction (degree only)	- Have pupils draw angles (especially 90°) using simple tools such as a protractor, T-square, or combination square. (Borrow tools from shop.) - Discuss use and reading of protractor. - Use duplicator to print a sheet of many angles in various positions for practice in measurement and classification as to type. Include triangles and quadrilaterals in angle measuring exercise. - Project film: #1356 - Lines and Angles #1759 - Measuring and Squaring
Time	- Teach pupils to write dates short way: June 12, 1962 = 6/12/62. Also reverse this: 6/12/62 = ? - Provide practice in finding exact passage of time; such as age to exact day. - Give practice in ways of reading time on face of a clock dial. - Use a radio or T.V. schedule for practice in simple addition or subtraction of time problems (also plane, bus, or train tables). - Make a map showing time zones; international date line.

Skills and Concepts — Activities

Time

(Contd.)

- Ask "What measures do the following numerals suggest?" 52, 7, 12, 4, 360, 32, 16, and 2000.
- Help pupils learn to use 30, 60, 90 days as fractions of 360 day year.

Denominate Numbers

- Review addition and subtraction of denominate numbers.
- Use problems such as finding the perimeters of squares and rectangles (fencing around gardens, baseboards around a room, weather stripping around a window, or total weight of a dozen cans of food).

Meter Reading

- If possible, have class examine real electric and gas meters; or make a replica of one of cardboard or plywood with movable hands. Practice reading.
- Have pupils read own meters at home and report to class. (Same day as meter reader).
- Have pupils bring electric and gas bills from home to find local rate charged, and calculate cost of using certain amounts of electricity and gas.
- Offer simple problems of dealing with cost of using electric bulbs and appliances.

  Example: John used a 60 watt lamp 4 hours every evening during November. How many watt hours of electricity was this? How many kilowatt-hours was this? How much was cost at 4¢ per K.W.H.?

  Example: Find cost of using following appliances at 4¢ per K.W.H.

Appliance	Time	K.W.H. Used	Cost
500 Watt percolator	8 hrs.		
1000 Watt iron	15 hrs.		
1170 Watt toaster	30 min.		
470 Watt vacuum cleaner	10 hrs.		
225 Watt television	25 hrs.		

Skills and Concepts	Activities
Scale Drawing Readiness	- Review ratio. - Encourage the class to collect scale drawings, both those that enlarge a picture and those that make a picture smaller; i.e., photographs, maps, house plans, pictures of plants, television scenes, or sketches of cells and atoms. - Compute with pupils the air distances from Cincinnati to Columbus or Indianapolis, using a map with a simple scale such as 1 inch for 40 miles. - Use a scale drawing of a classroom. What is the true size of the classroom? - Discuss a ratio of 1 to 1. What size would the drawing be? - Help pupils by representing the scale with a concrete example. If the scale is 1 inch for 2 yards, and a distance of 24 yards is to be represented, show that 24 yards is 12 two-yard lengths. Each two-yard length is represented by an inch, so that the length of the scale drawing should be 12 inches. Tokio paper simplifies the measuring involved. - Give drill on selecting appropriate scales for drawings of a classroom 24' x 33', a room 10' x 14', insect 1/4" x 1/8", or a temperature of 36 degrees. - Let the pupil make a scale model of himself.
General Review	- Discuss which units will be most suitable for many suggested measuring situations. - Present abbreviations of all measurement words. - Review order of months; days in each. - Offer many social and local problems utilizing measurements of all types. - Present numerous problems which change all above-mentioned measures to equivalents: 18 ft. = ____ yds.; $2\frac{1}{2}$ min. = ____ sec.

Skills and Concepts	Activities
General Review (Contd.)	- Ask thoughtful, penetrating questions concerning measurements: What should I buy instead? (When store does not have the right size) Is 4 oz. the same as 1/4 lb? Is a package of cold cuts marked 10 oz., more or less than 1/2 lb.?

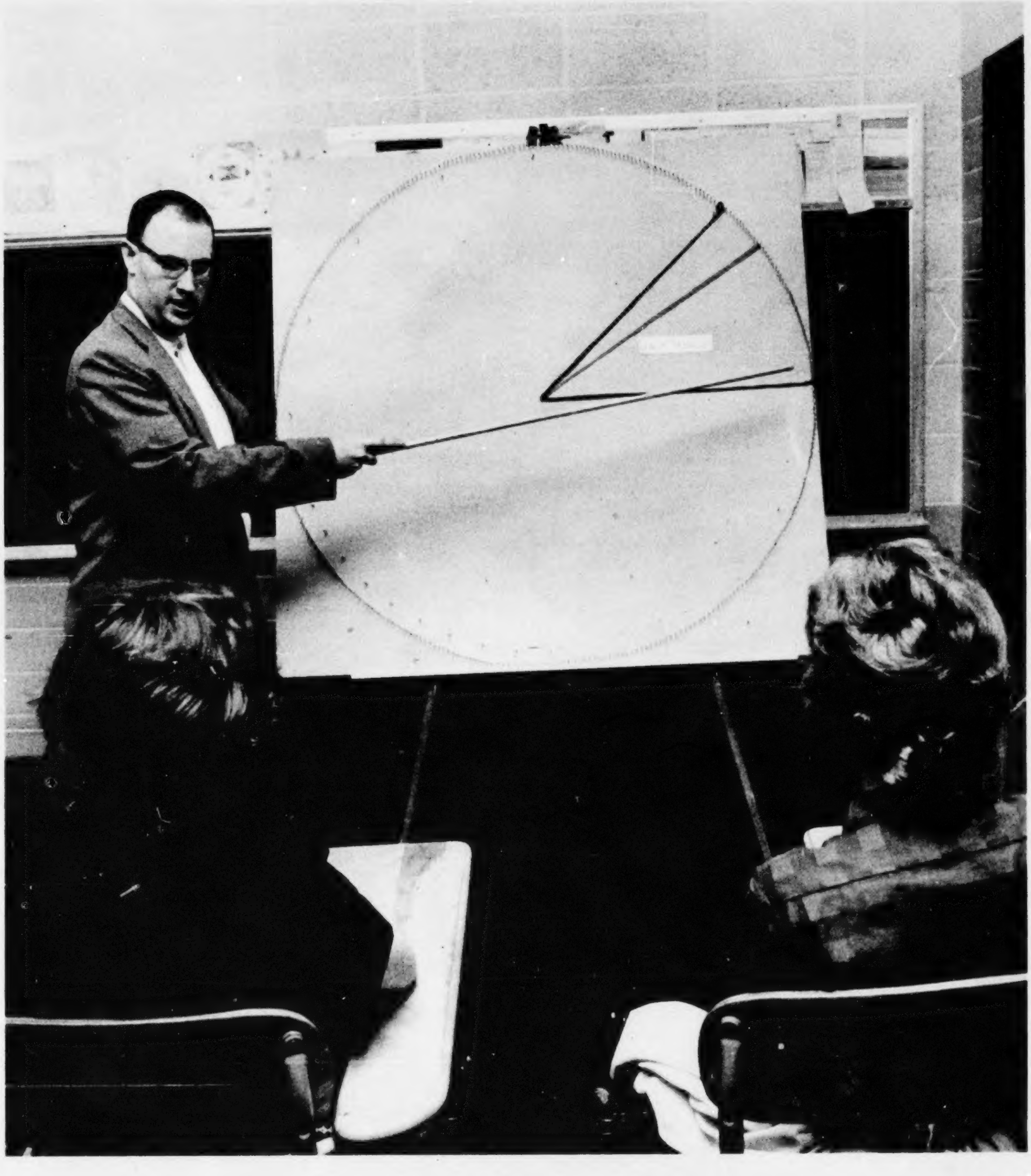
GAMES FOR DEVELOPING SKILL

Many teachers find that games and the spirit of competition successfully motivate pupils in the Modified General Program to memorize basic facts, equivalents, correct spelling, vocabulary and other specific bits of information. Sometimes games which involve luck should be used to prevent embarrassment of the less capable. If a teacher's control is not yet firm, games involving mobility should be saved for later use.

GAMES FOR DEVELOPING SKILLS

Skills	Game
Oral work in simple addition, subtraction, and multiplication of whole numbers or in expressing fractions in simplest form or in adding fractions where denominators are the same	Variation of Spelling Bee Divide the class into two teams. Ask a question of one member. If he answers the question correctly, he earns two points for his team. If he cannot answer the question, the child on either side of the original person questioned gets an opportunity to answer the question. If either child is successful, he earns one point for his team. If not successful, the question goes to the opposing team. Another variation of a spelling bee begins with all pupils standing. During the first and second round anyone who misses must sit down. However, on the third round, an opportunity is given for those pupils sitting down to answer the questions missed by those standing. Thus they have another chance to stand. Every other round they have another chance. Thus they do not lose interest in the proceedings.
Practice in the four operations in whole numbers, in fractions, in recalling common fraction and percent equivalents, and in reviewing the relationship between measuring units.	Number Lotto Lotto cards are made of square pieces of cardboard. On each card there are placed 3 rows of 3 numbers each. Each player is given a card and he provides himself with covers. A caller holds up a flash card with a number combination and if a player has the correct answer on his card, he covers the number. The first player to cover all nine of his numbers is the winner, and becomes the next caller.
Practice in addition and multiplication with whole numbers and fractions	Spinning Game On large white cardboard, 20 x 26, is drawn a circle with a 12" radius. Inside the large circle is drawn a smaller circle with a radius of 4". The larger circle is divided into nine sections, each representing a different number. In the center of the smaller circle is placed a wire with a pointer at one end. The class is divided into several teams with each player on the team being allowed two spins each. The player finds the product or the sum of the

Skills	Game
	two numbers he spins to get his individual score. Each team totals the score of its individual players to reach the team score. The team with the highest score wins.
Forming and reading whole numbers, decimal fractions, and mixed numbers.	Merry Mix-Up Each of two teams is supplied with a set of eleven flash cards. These cards each contain one of the ten digits and a decimal point. The teacher names a number such as 128, 5.06, or .097. The teacher and the other pupils who are not involved in the game decide which team has formed the numeral first. The teams can also be asked to name the largest or the smallest number possible with designated digits.
Practice in vocabulary associated with mathematics	Stump the Experts A panel of six pupils sits in front of the class. The teacher shows the class but not the panel a word used in Mathematics. The panel tries to discover the word by asking the class questions which can only be answered by "yes" or "no." For example, "Is this word associated with Multiplication?" "Is this the name of a plane figure?" If the panel has not discovered the word in ten questions, a new panel is formed. A panel remains in the front of the class until it is "stumped."
Practice in operations with whole numbers, common fractions, decimal fractions, percent equivalents, finding the factors of a number, or selecting primes	Around the World The first two youngsters in the first row have a contest to see who can answer the flash card combination first. The winner goes on to the next person to compete with him. If a child is the loser, he remains at the place or seat where he lost. Only by winning can he move on. He tries to get around the class and back to his seat again. Time does not always permit this. Then the winner is the child who has traveled farthest from his seat.



CREATIVE TEACHERS DEVELOP MEANINGFUL TEACHING AIDS

MATERIALS USEFUL FOR TEACHERS IN THE MODIFIED GENERAL PROGRAM

Available from the Warehouse

NO.		UNITS	
2179	Paper - Construction - 20" x 26" - Colors	5 Sheets	$ .17
2188	(Black: 5 for $.20) (Yellow: 5 for $.15)		
2167	Paper - Bristol White - 25" x 30"	Package	4.26
582	Beaver Board - 22" x 28"	Sheet	.18
5743	Tape - Masking - Tan - 3/4" x 25'	Roll	.23
7537	Cement Rubber	Pint	.37
7710	Ruler - 15" Metal Edge	Each	.09
4840	Yardstick - Maple - Brass - Stanley	Each	.77
7720	Stapling Machine - 1/4" Staples	Each	3.82
4805	Staple - 1/4" - 5000 to box	Box	1.20
7756	Twine - Light	Ball	.29
5514	Clock Dial - 12" Face	Each	.60
5559	Felt Fractions (Fractional Parts) No. 220	Each	.73
5560	Numerals - No. 224 (Felt Pcs.--Circles, Fractions)	Each	.73
540	Chalk - Poster - 1/4" - 36 assorted	Box	2.20
2313	Paper RnBo - Assorted Colors - 9 x 12 - 245	Package	.12
3175	Measure Tape - Cloth	3	.17
2441	Ruler 12 in. Long, 1/16" Markings	Dozen	.78
2442	Ruler 12 in. Long 1/8" Markings	Dozen	.78
2443	Ruler 12 in. Long 1/4" Markings	Dozen	.78
2444	Ruler 12 in. Long 1/2" Markings	Dozen	.78
2231	Paper - Tokio ruled, 1/4 sq. 9" x 12"	Pkg. (250 sheets)	2.52
2232	Paper - Tokio ruled, 1/2 sq. 9" x 12"	Pkg. (250 sheets)	2.52
5703	Scissors - Round Point 5 inch	Each	.61
	Geometric Models Made at Central High School	Set	

The warehouse catalogue contains other items which also may be helpful to the teacher in the Modified General Program.

Available on Purchase Requisition

Pupil Protractor (Plastic) Kiger No. 520 at $1.00/doz.

Kiger and Company
1830 West 16th Street
Indianapolis, Indiana

Aqua Bright Art Color Kit No. 4B at $10.25
(Felt Pens)

Time Saving Specialties
2922 Bryant Avenue, South
Minneapolis, Minnesota